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COMPETITIVE BEHAVIOR OF AIRLINES AT MULTIPLE AIRPORT SYSTEMS

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by

Edmund Chen

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ABSTRACT

The way passenger traffic is distributed at multiple airport systems continues to intrigue air transportation planners, urban planners, and policy-makers as researchers attempt to unravel how airlines, air travelers and airports relate to each other. While previous research efforts have typically concentrated on the air travelers' choice of airports, the current thesis addresses how the competitive behavior of airlines operating in a deregulated environment influences the air traveler's choice of airports and the resulting distribution of passenger traffic in the multiple airport system.

The methodology of the research first involves identifying four scenarios under which airlines compete in multiple airport environments, after which an anecdotal analysis of a select number of city-pair markets for each scenario was performed to solicit supporting evidence of competitive behavior of airlines. To keep the preliminary investigation simple, the author has chosen to study the dual-airport systems at Chicago and Houston. Owing to limitations of the data from *O&DPlus* and *ONBOARD*, the author used a strict set of criteria to identify 14 city-pair markets to analyze the response of passengers and airlines to challengers entering the city-pair markets between 1984 and 1993. The six quantitative indicators used in the anecdotal analyses include: average fares, average number of nonstop departures per day each way, quarterly origin-destination traffic, quarterly non-origin-destination traffic, average quarterly load factors, and the quarterly total airport-to-airport origin-destination traffic.

The results of the research indicate that while competition is evident, a general trend of competitive behavior of the airlines in the multiple airport environment is not discernible. The entry of a challenger typically elicits a variety of responses. Significant stimulation of the origin-destination traffic was observed in cases where low-fare carriers entered the market. The fact that the number of non-origin-destination passengers usually exceeds the number of origin-destination passengers may indicate that justification for the service in the airport-pairs examined goes beyond simply satisfying the demand for travel in the origin-destination market. Although quantitative modeling techniques were not used in this study, the author believes that future researchers should contend with the complex, multi-dimensional nature of airline competition before attempting to accurately model the competitive behavior of airlines at multiple airport systems.

Thesis Supervisor:
Professor Robert W. Simpson
Director, MIT Flight Transportation Laboratory

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He bestowed upon me the coveted title of "King of *O&DPLUS*" when I would have humbly settled for an Honorary Master of Science in Official Airline Guides. But for all the fun I have had in 16.74 and 16.75, I feel wholly compelled to acknowledge Professor Peter P. Belobaba.

After an extended period of silent contemplation, I have finally realized that it may be appropriate to dedicate the following thesis to my mother, Irene, since she was the one person who made me spell "M-a-s-s-a-c-h-u-s-e-t-t-s I-n-s-t-i-t-u-t-e o-f T-e-c-h-n-o-l-o-g-y" when I was seven.

Owing to physical limitations of space on this page, I shall not be able to include the full names of each and every person who has made my life at MIT pleasant and memorable. However, I trust that you should know who you are by now. On the other hand, I will forgive those of you who have made my life at MIT absolutely miserable...

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CHAPTER 1

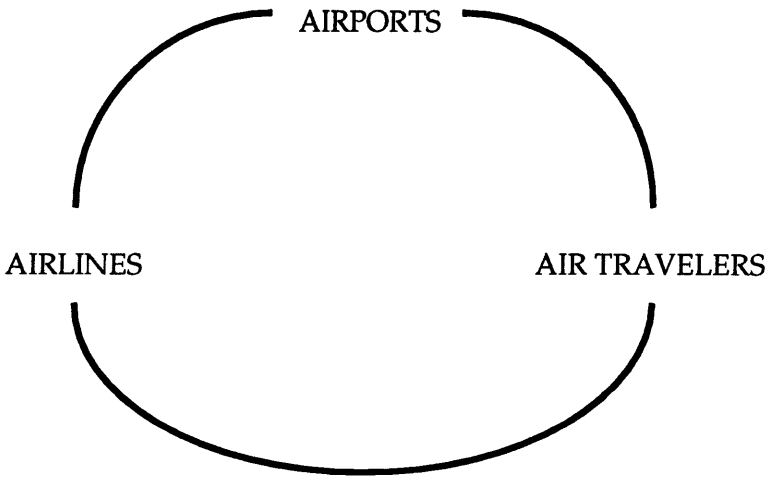
INTRODUCTION

Large metropolitan areas that have more than one commercial airport within proximity of each other have intrigued air transportation planners, urban planners, and policy-makers for over two decades because problems pertaining to such multiple airport systems, as they can been aptly christened, are truly multidisciplinary in nature. A naive observer may well be tempted to ask, "Isn't one airport per city good enough?". Yet, as one moves one's fingers across a globe, one readily encounters examples of such multiple airport systems, notably those of Montreal, New York, Washington, Chicago, San Francisco, Los Angeles, Tokyo, Milan, Berlin, Paris, and London - just to name a few. Before the year 2000, new multiple airport systems at Osaka (Itami and New Kansai), Seoul and Hong Kong (Chep Lap Kok, Macau, Shenzhen) would be added to the already long list. However, the underlying feature that is of interest is the way passenger traffic is distributed amongst the airports in the system. In particular, if the distribution is unequal, one might well wonder what invisible forces could possibly bring about such an observation, and what could then be done to enhance the commercial viability of the under-used airports within the system.

At the onset, one may suspect that the airports are competitive with each other, especially if government intervention or entry barriers are absent. However, a common perception is that the air traveler is the user of the airport, in which case it then follows that the airports are merely providing a service that air travelers require. Accordingly, ground accessibility would be cited as an important determinant of the distribution of passenger traffic at multiple airport systems. In other words, depending on the quality of ground access, which can be quantified by travel time and cost, each airport has its defined catchment area if they all provide services to a common destination. Yet, this perception may be wholly inadequate because it implies that once an airport is built and the supporting roads and infrastructure are in-place, the distribution of the traffic is easily defined. While the notion that passengers do choose amongst airports is valid, one may note that the fundamental flaw is that the conventional model has left out the airlines as the other significant users of airports. In particular, by examining how airports compete with each other, it is imperative that one understands how airlines choose amongst the airports, and how they respond to competitors operating at the same or other airports within the multiple airport system. Indeed, if airlines are motivated by profitability concerns, the justification for serving one or more airports

within the system should be commercial viability as opposed to public convenience or necessity. Although this idea paints a mercenary picture of airlines, the airlines do aim to provide a service that passengers prefer but wish to do so profitably - if they can.

Thus, the above discussion leads to the proposal of a relationship linking the three entities of air travelers, airlines and airports as shown below:



In essence, the pictorial relationship states that the decisions of both air travelers and airlines determine the distribution of traffic in a multiple airport system; air travelers are the customers of airlines, while airlines are, in turn, the customers of the airports. If the above hypothetical relationship is true on the grounds of basic logic and rationality, then one should closely examine the frequently ignored component in the equation: airlines. Indeed, while previous research efforts have usually focused on the way air travelers choose between airports and airlines, few have really ventured to unravel the mystery behind how airlines choose - to the extent that they can - amongst a given set of multiple airports in a large urban region. Although de Neufville [1] claims that capturing the competitive dynamics of airlines can be "quixotic", and that a "detailed model" is unnecessary because the results of the competitive fray are predictable, the author sees the need to address the nature of competition amongst the airlines because understanding the interdependency between air travelers, airlines, and airports in multiple airport systems may help airport planners and airline managers better cope with the inherent uncertainties of traffic forecasting, and the subsequent use of airport facilities.

This thesis is conveniently divided into seven chapters, with the first four expounding on previous research efforts, a functional definition of the multiple airport system, the nature of competition, and how airline competition in the United States has changed since the advent of deregulation in 1979. Chapter 5 discusses the methodology of the research while Chapter 6 provides an anecdotal analysis of the competitive behavior of airlines in several selected cases of interest. Lastly, Chapters 7 comments on the results of the research, and discusses the possible implications of the results.

CHAPTER 2

REVIEW OF PREVIOUS LITERATURE

A survey of previous literature on the subject of multiple airport systems revealed that few have attempted to understand the competitive behavior of airlines operating in multiple airport environments. Instead, previous research efforts have typically focused on aspects such as the differential ground accessibility to and from airports, the modeling of air travelers' choice of airports, and the economic feasibility of building secondary airports in the vicinity of an already established primary airport. Yet, the interdisciplinary nature of the subject is amplified by the fact that research is usually undertaken by those in the disciplines of engineering, economics, public policy, and urban planning. This chapter aims to highlight some of the more notable studies in multiple airport systems.

2.1 Modeling The Way Air Travelers Choose Between Airports

Recognizing the notion that airport utilization is the result of the interaction of choices made by both airlines and air travelers, Greig Harvey of Stanford University [2] investigated the way passengers choose among departure airports in the San Francisco Bay Area (the airports of San Francisco International, Oakland, and San Jose), drawing on a 1980 air passenger survey conducted by the Metropolitan Transportation Commission of Oakland, California. Applying the multinomial logit model, developed by Professor Moshe Emanuel Ben-Akiva at Massachusetts Institute of Technology [3], to both business and non-business travelers, Harvey demonstrated that ground access time and frequency of direct air service to a chosen destination can account for a large portion of the variation in airport use in a multiple airport city. The results further suggest that multiple-stop flights are "strongly preferred" to connecting flights when a traveler is choosing between a departure airport that is further but offers nonstop services to the final destination, and a nearer airport that offers multi-stop services to the same final destination. He concludes by emphasizing the importance of ground accessibility in the planning of multiple airport systems and the need to incorporate airline schedules in effectively predicting the air traveler's use of airports within a large urban area.

During the same period, Professor Norman Ashford of Loughborough University of Technology (United Kingdom) [4] conducted a similar research on multiple airports in the British Midlands, whereby the choice of airports was examined for air trips

originating at the airports of Birmingham, East Midlands, Luton, and London-Heathrow. The study, which was based on verified data tapes provided by the British Civil Aviation Authority for two surveys conducted in 1975 and 1978, included comparatively more detailed questions about the type of trip, mode of access, and social economic status of the traveler. The results of the finding indicate that the model used in the Stanford study is "reasonably transferable", and that a traveler's choice of airports can be successfully predicted, given access times, flight frequency and fares. More specifically, the study revealed that access time and flight frequency are important, in that order, for business and inclusive-tour trips, while the ranking for short haul domestic and leisure travelers is: fares, access times, then flight frequency. In other words, business passengers are more time conscious while leisure passengers are sensitive to fares.

With the "successful" [4] calibration of the model for choice of airports in both the United States and the United Kingdom, researchers went a step further to examine the applicability of the model to the developing country of Nigeria, a country where the standard of surface transport infrastructure is lower and the socio-economic conditions different from that of the United States and the United Kingdom [4]. The airports of interest were the two regional airports at Benin and Enugu. In an attempt to model the passenger's choice of airports for flights to the main hub at Lagos, researchers conducted an on-aircraft survey in the summer of 1987. The Nigerian model is unusual in two respects. First, stratification was not significant as passengers were overwhelmingly engaged in private or governmental business; few were leisure passengers. Second, fares and flight frequency were non-significant because strong governmental control over aviation meant that competition between airlines on the basis of fares did not exist, and that since Lagos is the main hub, flight frequency to the hub was abundant from both Benin and Enugu.

On the other side of the globe, Professor Frank S. Koppelman of Northwestern University and Masahiko Furuichi of the Japanese Ministry of Transport [5] analyzed air traveler's choice of departure airports in Japan for international travel by applying a nested logit model. A survey was conducted in 1989 on passengers departing from the four main Japanese international airports of Tokyo (Narita), Osaka (Itami), Nagoya, and Fukuoka, all of which offered more than 70 international flights per week[1]. The results of the study lend more support for the nested logit model than the multinomial logit model, and that both business and pleasure travelers place a high priority on airport access time, total trip time, and flight frequency.

[1]Many of the 12 international airports in Japan offered fewer than 10 flights per week in 1989.

One salient observation with regard to the four studies mentioned above is that while the Stanford study considered three airports within the same large metropolitan area, the studies in the United Kingdom, Nigeria and Japan, however, sampled airports which are in distinctly different cities and do not bear the same relationship as the three adjacent cities of, say, Oakland, San Jose, and San Francisco. Thus, the Bay area may be a multiple airport city, but United Kingdom, Nigeria and Japan should more aptly be classified as multiple airport countries. Yet, with the exception of Nigeria, the three studies conducted in the United States, the United Kingdom, and Japan display some similarities in that airport access, trip cost, and flight frequency do play a vital role in an air traveler's choice of departure airports, whether one speaks of a multiple airport city or a multiple airport country.

Although the Multiple Airport Demand Allocation Model (MADAM) has been used between 1973 and 1983 [6], the Joint Metropolitan Washington Council of Governments and Maryland Department of Transportation, in 1985, calibrated the model to perform extensive sensitivity analysis on the traffic distribution of passengers in the three Washington area airports (Baltimore, Dulles, National) for the purpose of using the quantitative results to support five policy alternatives regarding the commercial use of airports. The model aimed to replicate the expected behavior of passengers and airlines in the demand, provision, and distribution of air services for a given operational environment, as encapsulated by the following four factors: the spatial and temporal pattern of passenger movements, the access time to airports, the airport's physical characteristics, and the airline's scheduling patterns. The Authorities were aware that the model could neither account for macroeconomic disturbances nor generate "economically optimum" [6] solutions for airlines; they readily recognized that the model was meant to be descriptive instead of prescriptive. However, an interesting feature of the model is its use of an iterative process to allocate passengers and flights at the airports within the system, whereby if one of the airports is full, the remaining pool of passengers is re-distributed to the other airports until none of the airports exceeds its designed capacity. Strange as it may sound, the Authorities claim that MADAM has been accurately calibrated to replicate the base year conditions and that it is flexible and responsive to incremental changes in airport access improvements, regional developments, and airline scheduling practices. They further conclude that MADAM is "reasonably accurate for intra-regional passenger assignment to the airports, somewhat less accurate for the extra-regional distributions, and least accurate for the aircraft flight pattern distribution per airport." [6] Perhaps the most critical comment brought forth is

that the model needs to incorporate the current deregulated airline operating environment, if nothing else.

The last of the studies on airport choice that will be discussed is the work of a then doctoral student, Mahmoud Sulaiman Abbas, at the University of California at Berkeley [7]. Abbas' study narrowly focused on the factors that affect the choice of airports of business travelers amongst a set of local airports in small communities that were located "within the sphere of influence" [7] of a large air transport hub. Using a statistical technique, with frequency of direct flights, fares, access cost and time, industry type, firm function and size, and traveler's age and income as key variables, Abbas found that the choice of airports in small communities is largely driven by the level of air service, with frequency of direct flights, available fares, and access cost and time appearing to be the most significant. Specifically, for a local airport that is close to a nearby large hub, parking cost appears to be the significant access cost variable, while for a local airport that is far from a nearby large hub, travel time appears to be the significant access cost variable. Nevertheless, Abbas did recognize that in order for the study to be of more general use, the study should be extended to non-business travelers under similar conditions, particularly because leisure travelers are now a sizable proportion of the total air travelers in the United States.

2.2 Other Approaches To The Problem

A different twist to the methodology of research on multiple airports is seen in three studies pertaining to the dual-airport cities of Dallas/Fort Worth, Detroit, and Houston. Specifically, these studies examine the changes in the behavior of air travelers when there is a transfer of most operations from an old airport that is nearer the city to a new but more remote one. Indeed, de Neufville and King stressed that such "quasi experimental" [8] methods are recommended because the changes, if any, take place so quickly that few external factors would have little time to vary. This, in turn, reduces the chances of the investigator making misleading conclusions about relationships between the variables under scrutiny.

Specifically, in their study of the Texas intra-state services between Dallas/Ft Worth and San Antonio and Houston - provided by Braniff, Southwest Airlines and Texas International between 1971 and 1975 [2] - de Neufville and King concluded that:

[2]Dallas/Fort Worth International Airport opened in the first quarter of 1974.

- Airport access is significant in short haul markets when travelers have a choice of airports and when the only available airport is made more remote. In fact, an overall decrease in demand is observed.
- Relative frequency is a vital determinant of market share, conforming to the usual S-shaped curve that relates market share and frequency share, when other factors do not intervene. However, when price and locational attributes enter the picture, relative frequency seems to have only secondary effects.

In a separate study, Linda E. Bower [9] had set forth with the hypothesis that air travel demand is elastic with respect to airport access costs, and that the distance of the airport from the city has an impact on the volume of passenger traffic at the airport. She defined elasticity as the percentage change in air passenger trips divided by the percentage change in airport access costs. Although "airport access costs" [9] had several components and Bower justified the way she estimated the individual components, de Neufville and King unveiled two main shortcomings of her study. First, they disagree with the way Bower calculated some of the cost components. For example, she should not have assumed that access time is equivalent to the time it takes to travel between the center of the city to the airport since less than a quarter of the passengers actually travel between these two points. They argue that given the high quality of circumferential highways, access time between suburban areas, where many travelers originate, decreases as airports move away from the center of cities. Second, they express qualms about Bower's use of only one city (Houston) in the study because she would then not be able to control for other interfering factors (such as changes in air fares and the 1970 recession in air travel), and thus fully isolate the effect of the change in airport access. In any case, after gathering data from 50 city pairs for the period prior to the closing of the more accessible Hobby Airport and the period after the opening of Intercontinental Airport, she found that short haul traffic (under 300 miles) fell dramatically after the relocation of the airport.

On the whole, de Neufville and King feel that most researchers seem unaware that people who frequently travel by air may choose to live near the airport. Consequently, the assumption that people are stimulated to travel more when they are closer to the airport is suspect. Yet, a causal relationship of this kind should be made clear if the study is to be valid. To this end, de Neufville and King believe the best way to measure the effect of changes in airport access seems to be that suggested by R. E. Park [10] in his study of the relocation of Detroit's airport in 1947. Here, he avoided many of Bower's difficulties with various estimates of access by simply not even

attempting to relate traffic loss to any measure of accessibility. Instead, he compared the evolution of Detroit's traffic with that of a control group. In particular, Park compared, for a time frame of 10 years, traffic between Detroit and cities within 300 miles, to that between other Midwestern cities and destinations of the same distance, a procedure which effectively removes interference from changes in technology, recessions, and any other influential factors that might affect all similar airports. In short, the focus of the study then reduces to the disparity observed that can be safely attributed to the relocation of the airport. Park concluded that the change in airport access did not affect the rate of growth, but did seem to have reduced the level of traffic by over 28% for a 25-mile move [10].

Nevertheless, credit must be given to Richard de Neufville for advocating the need to incorporate airline competition in studies of multiple airport systems. In particular, he emphasized that both airlines and passengers are users of airports, and that the conventional thinking that only passengers are the users is distinctly "myopic, slanted" [1]. Perhaps the reason that few have attempted to saunter through this avenue of thinking is that capturing the competitive behavior of airlines at multiple airports is "quixotic" [1], as de Neufville so believes. Yet, de Neufville's contribution to the study of multiple airport systems thus far is worth noting. In particular, he has extensively elucidated the planning and policy aspects of building secondary airports. He firmly believes that the size (dominant or subsidiary) and function (special character or undifferentiated) of a secondary airport should be carefully addressed as an insurance against possible serious future financial disasters, especially when planners casually assume that passenger traffic distributes itself according to "its own logic". [1] In short, de Neufville stresses that traffic cannot be forced to a specific airport within a system because the distribution is largely determined by the users - both passengers *and airlines* - the result of which is usually an unequal distribution of the traffic at the airports considered. However, the existence of distinct markets may limit the effects of concentration at any one airport, thereby permitting the co-existence of several airports within a metropolitan area, each of which can prosper in its own way. In the final policy recommendation for the United States Federal Aviation Administration [11], de Neufville puts forth a "threshold of viability" [11] of secondary airports of between 10 to 12 million originating passengers per year, a figure which he obtained after examining 37 multiple airports systems around the world. The final word is that in planning secondary airports, de Neufville advocates the application of strategic dynamic planning since flexibility in long-term planning counteracts the inherent uncertainties of passenger traffic.

Perhaps the work of Francois Cohas can be seen as an attempt to unravel the competitive behavior of airlines at multiple airport cities from a specific facet. In his master's thesis [12], Cohas captured, in a limited way, the dynamics of airline competition in multiple airports by developing a market share-frequency-share model. Based on a case study of the multiple airport systems of the San Francisco Bay Area, New York, and Washington, Cohas' main conclusion is that an S-shaped airport market share model can well be approximated by using just a few explanatory variables, namely, frequency of service, average fare at the designated airport, and average fare at competing airports.

2.3 Attempts At Modeling The Competitive Behavior of Airlines

As far back as 1973, Walter Gelerman [13] hinted an approach to modeling the competitive behavior of airlines by applying classical game theory. Building upon the familiar mathematical formula describing the S-shaped curve that relates market share and frequency share, Gelerman further recognized the interactive, interdependent nature of the competitive process whereby the market share of an airline depends not only on its own strategy but also upon that of its competitors. As such, he postulated that the actual market share of an airline is determined in a competitive game with symmetric properties in which each airline attempts to maximize its share but is opposed by other airlines sharing the same objectives. Accordingly, the solution to the game is then defined by equilibrium states in which each competitor is content that it cannot improve its position under existing market and regulatory constraints. Given that each strategy prescribes the number of flights an airline should offer at each of the airports in the multiple airport system, Gelerman believed that knowledge of the minimax strategy would then indicate how airlines use satellite airports. To execute several simulations of the game that he proposed, Gelerman constructed payoff matrices that showed all possible outcomes of different choices made by two airlines under various situations. The results of the simulations point in the direction that it is in the interest of an airline to concentrate all services at a particular airport of the multiple airport system because of geographic advantages associated with one of the airports. In addition, the second order effects are that an airline would offer a minimum number of flights at the satellite airports, in which case absolute matching of schedules is unlikely. Although the study was conducted during the pre-deregulation years, for which applicability may be severely limited today, the study is, nevertheless, insightful in that it may give future researchers some hope of modeling competitive behavior - if at all possible.

A more general model of the competitive behavior of airlines under regulation was conceived by John C. Panzar [14] in his 1974 doctoral dissertation at Stanford University, whereby he attempted to show the importance of quality variation in competition under price regulation. In his analysis of price and schedule quality in a stylized airline market, Panzar concluded that "social welfare maximization may require that the industry be subsidized" [14], but this subsidy will be quite small for the "heavily scheduled" [14] markets. As the airline industry stands today, subsidization is virtually non-existent except for service to small communities which were guaranteed under the Essential Air Service Act. However, upon moving beyond a regulated market to characterize equilibrium in an unregulated market (with free entry and the absence of price regulation), Panzar discovered that although the equilibrium is "suboptimal" [14], the unregulated market performs optimally if, at equilibrium, the number of scheduled flights is so large that any further increase would not affect the demand for air travel. While Panzar's economic treatise seems less relevant in the present deregulated environment, he correctly identified that schedule rivalry is one aspect of airline competition. In fact, as one shall see in Chapter 4, airline competition encompasses a large array of variables beyond flight frequency. However, Panzar's basic notions were, after all, correct.

The current chapter does not attempt to provide an exhaustive discussion of everyone's contribution in the area of multiple airport systems, but it should suffice to say that extensive studies have been undertaken to cover various issues and problems surrounding multiple airport systems, and that interest in multiple airport systems has not waned after more than two decades. In preparing the following thesis, the author hopes to add to the already extensive collection of studies by exploring an area which is relatively untouched for now. However, before addressing the competitive behavior of airlines in multiple airport systems, it would be prudent to review the general nature of airline competition in a deregulated environment, such as that in the United States since 1979.

CHAPTER 3

DEFINING THE MULTIPLE AIRPORT SYSTEM

3.1 A Functional Definition

Arriving at a functional definition of a "multiple airport system" is necessary in that it lays the basic reference unit for analysis of the behavior of air travelers and airlines within such a special environment. Very often, the words "multiple airports" inevitably conjure images of the airports such as those of the New York area, the Washington area, the San Francisco Bay Area, Los Angeles, Chicago, Houston, London, and Paris. Indeed, a common feature of all such airport systems is the relative proximity of the airports within each respective metropolitan area, however large the area is. Therefore, a simple definition of a multiple airport system is: a set of airports serving an urban area [11]. Accordingly, a multiple airport system should include all the airports that air travelers and airlines both perceive as serving the populous urban region, regardless of which jurisdiction the airports falls under. For example, Oakland International Airport is a member of the multiple-airport system of the Bay Area while Baltimore/Washington International, though located in Maryland, is a member of the Washington D. C. area airports. However, to accommodate rapid changes in urban structure over time, de Neufville recommends the use of a "functional, geographic definition" [11] of a multiple airport system, for which an airport should satisfy two important criteria before membership within the system is permitted:

- The airports are close to the existing major airport so as to capture a significant share of the traffic of the metropolitan region, and
- The airports are officially designated and operated as part of the multiple airport system by the local authorities.

By far, the first of the two conditions is the more important membership criteria; the second condition applies only to special cases [11].

With the first basic definition in mind, one may now consider Figure 3.11 on the next page, which serves to illustrate the essential features of a generic multiple airport system. The diagram shows a simple dual-airport system, but one should realize that a multiple airport system can consist of more than just two airports.

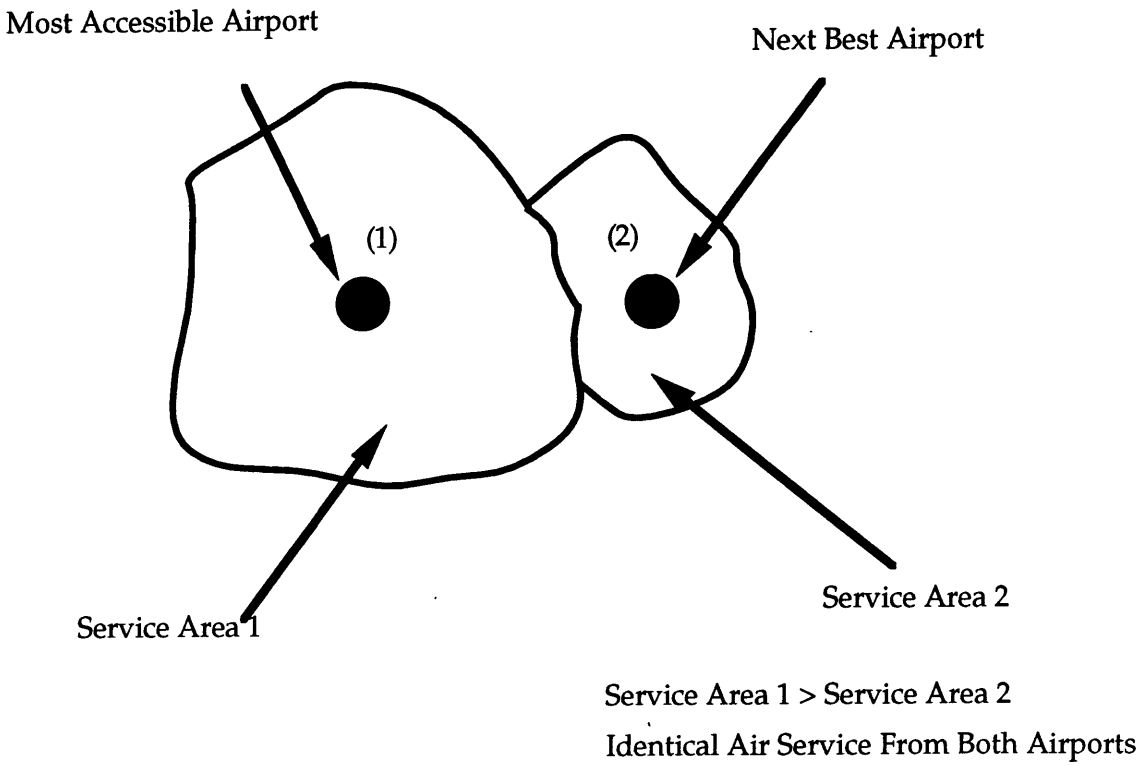


Figure 3.11 A generic multiple airport system.

Given two airports, say, Airport 1 and Airport 2, within an urban area, one may readily put forth the idea that each airport will have its own well-demarcated natural service area, the size of which depends on ground accessibility (trip cost, convenience, mode of transportation) and quality of air service variables (flight frequency, departure/arrival time, nonstop/multiple-stop/connecting flights to and from destination). The service area may be defined based on a study of a set of minimal cost paths between the airport and the air traveler's origin or destination. Therefore, if Airport 1 were the more accessible airport and that the quality of air service were identical at both airports, one may reason that Airport 1's service area will be larger than that of the next best Airport 2. On the other hand, if the quality of air service were not identical, which usually is the case, one would expect overlapping service areas because some air travelers in either service area may 'defect' to the other airport for reasons such as the availability of lower fares or a significantly better choice of flight times. In fact, the two airport-city pairs would then constitute what are known as "parallel markets" [15], a term which indicates the potential substitutability of one airport-city pair for the other in the eyes of the air traveler. Hence, one may postulate that the disparity in the quality of air service is the main signal of competitive behavior

of the airlines serving a given multiple airport system. Specifically, an airline operating to and from some or all the airports in the system is usually seeking to enlarge its service area so as to capture as large a share of the total origin-destination traffic as possible in order to justify the economics of the operation to and from the huge metropolitan area. In a deregulated environment, where airlines are given significant amount of freedom - albeit subject to constraints such as gate availability and landing/take-off slots - to alter fares and flight frequency at will, the intensity of the rivalry, however measured, would certainly be of interest to both airlines managers, airport planners, and even the consumers (passengers). In short, the very seat of this thesis research has been identified.

de Neufville [11] reasons that the competitive environment clearly contributes to problems of concentration at the primary airport since the more accessible and typically bigger airport attracts more flights and passengers, thereby resulting in both a positive feedback loop which enhances the quality of air service to that airport, and a negative feedback loop which leads to undesirable levels of congestion at the same airport. Figure 3.12 below illustrates the dynamics of traffic concentration at the primary airport of a given multiple airport system.

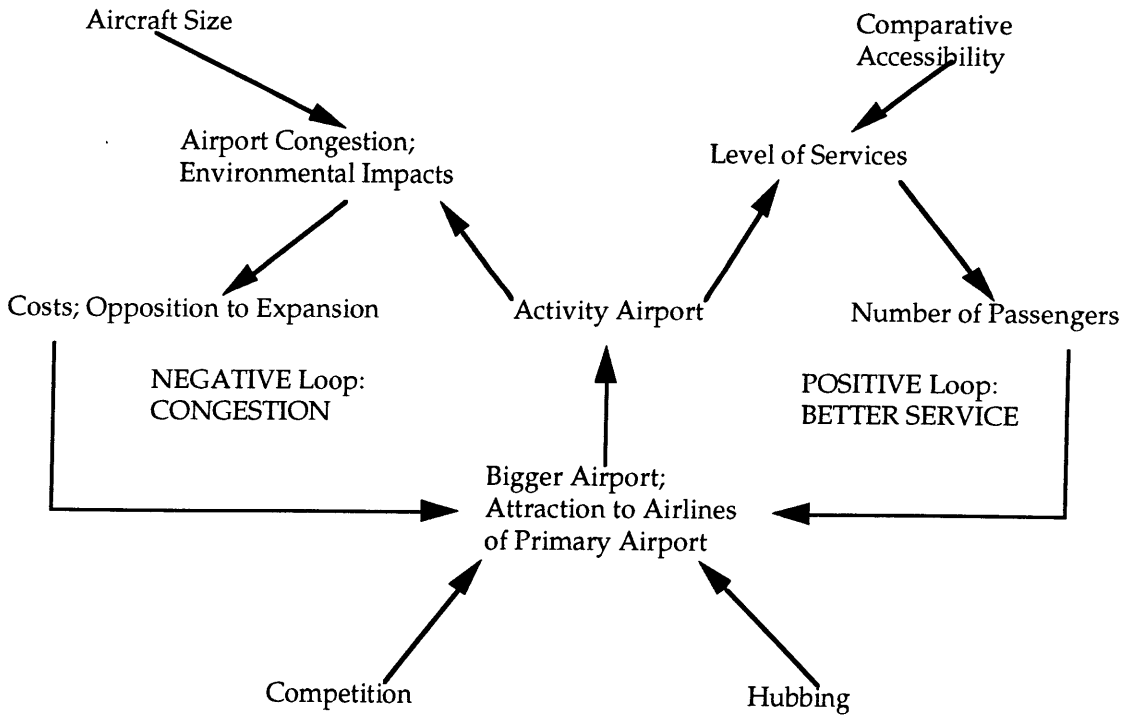


Figure 3.12 Concentration at the primary airport [11].

Using this line of reasoning, de Neufville argues that secondary airports usually become niche players serving their respective adjacent communities and host carriers with rather unique operations. An example is United Airlines and its commuter affiliate's operations at Washington-Dulles International Airport, whereby one may expect United Airlines to attract travelers in the Washington area who may be loyal to its frequent flyer program, travelers whose origin or destination is in the vicinity of Dulles Airport, or those who wish to fly internationally directly from Washington-Dulles. However, the notion that niche-carriers and airports may exist within the multiple airport system does not imply that such airports and airlines do not participate in the competitive fray. For example, Southwest Airlines has been highly successful with its operations in less congested alternative airports in multiple airport cities such as those at Dallas-Love Field, Houston-Hobby, Chicago-Midway, Detroit-City, Oakland, San Jose, Burbank, Orange County, Ontario, and more recently, Baltimore. Then, the now defunct Midway Airlines once operated out of its hub at Chicago's less congested Midway Airport. Thus, given that airlines do maintain operations at such secondary airports, it should be revealing to understand the competitive pressures that keep such air services in place.

3.2 The Issue of Ground Accessibility

While this thesis focuses on the competitive behavior of airlines, one should not ignore the importance of ground accessibility as a contributing factor that determines the distribution of passenger traffic within the multiple airport system. It is thus appropriate to provide a brief discussion of ground accessibility prior to expounding on the nature of airline competition in the next chapter.

Indeed, convenient accessibility can perhaps make a more distant airport within the system more attractive, thereby broadening the definition of multiple airport systems to include even small outlying communities that are near larger air hubs. In particular, multiple airports cities such as London (Heathrow and Gatwick Airports), Paris (Charles de Gaulle), Frankfurt (Main), and Baltimore are linked to outlying towns by frequent intercity trains, which in turn potentially enlarges the catchment area for the airport concerned - even if there is a smaller airport in the outlying town. By 1995, London's Heathrow Airport will have a direct British Rail link to London's Paddington Station from which air travelers can reach other cities in England or Scotland. Paris' Charles de Gaulle Airport will be linked to the city of Paris by way of an extension of one of the local transit lines. Access to other cities in France and Europe will be possible by means of the new Trains a Grande Vitesse (TGV) [16]. Similarly, a train service

between Baltimore Airport and downtown Washington D.C. attempts to draw passengers from the already well-served D.C. area to use the less congested Baltimore airport, an airport which now offers low fares to many cities since the arrival of Southwest Airlines, Continental Lite and USAir. At the extreme end of ground accessibility and convenience is Virgin Atlantic Airway's offer of a free door-to-door limousine service between the airport and some point within a certain radius from the airport for its Upper and Mid-Class passengers. While such a service is considered a luxury, numerous door-to-door airport service operators have sprung-up to enhance accessibility.

To stretch the definition of accessibility and multiple airport system a little further, one may consider how residents of small outlying communities choose between several distant major airports even though there is a small airport near the community. Connin and Leggett's [17] study on the demand for rural airport business travel at Altoona-Blair County Airport (Pennsylvania) revealed that even though flights operated by USAir's commuter affiliate are available between the County Airport and Pittsburgh (USAir's hub), the small airport is less attractive for business travelers than a 2-hour drive to Pittsburgh or Harrisburg, a 3-hour drive to Washington-National Airport, a 3.5-hour drive to Baltimore Airport, or a 5-hour drive to Philadelphia International Airport, from where convenient direct and nonstop air services are available to an air traveler's final destination. The researchers highlighted that rural airports lack control over many important quality of service variables such as flight frequency. Nevertheless, the researchers believe that the difference between a "moribund rural airport" [17] and a prosperous one may lie in the skill, talent and ingenuity of airport managers, local business groups, and the clout of elected officeholders in delivering the necessary funding for the development of such regional airports so that a more competitive travel network may be created.

With diminished air service to smaller outlying communities, a multiple airport system would, in reality, encompass a larger set of airports within a larger region. As in the above example, the multiple airport region could, in principle, consist of six airports that effectively serve the extended region. However, to limit the scope of the thesis, the author will consider only multiple airport systems within a large urban area, as opposed to a multiple airport system consisting of a collection of populous urban areas.

To offset the problem of the lower quality of ground accessibility in small rural towns, Mary Kihl [18] proposes coordinated intermodal linkages rather than mode-specific linkages between small communities and distant major airports. While Kihl laments that deregulation has brought about adverse changes in the quality of air service

to small communities, especially with respect to scheduling, carrier service, and fares, she points out that dedicated airport bus services from single small cities to airports may not generate sufficient ridership Although Kihl did not arrive at very concrete solutions, she maintained that there is a need to reassess the role of public transit, private interstate carriers, and commuter carriers in providing transportation services to small communities, and that the possibilities for a linkage and coordination must be explored to "maximize both efficiency and effectiveness in operation." [18] Nevertheless, she believes that a system cannot be successful without a firm local commitment to continued transportation in rural communities.

On the contrary, a collection of communities that are quite near each other do have problems of their own. de Neufville points out that some Bostonian residents may actually be living in a multiple airport region because of the way the highways in the Boston area are designed [11]. Specifically, he believes that as a large number of business centers and suburbs are located in the vicinity of the ring highway of US Route 128 and Interstate 95, a Bostonian may, at any one time, be closer to one of the three airports of Providence (Rhode Island), Worcester (Massachusetts), or Manchester (New Hampshire), each of which is within 50 miles of the ring road around Boston. However, the wider choice of direct flights to more destinations out of the main airport of Logan International seems to make Boston the major gateway to the New England area as a whole.

More recently, a research fellow at Loughborough University (United Kingdom), N. N. Ndoh [19], proposed the application of the familiar "level of service" (LOS) concept for monitoring the quality of airport access. Although Ndoh recognized that access plays a key role in the distribution of passengers between airports in a multiple airport system, he laments over the "lack of standards" for measuring the quality of access. He attributes this, in part, to the fact that access services are usually externally provided, and that each mode has many attributes of which cost, comfort, and convenience most significantly influence air travelers' perception of access LOS. However, two techniques may be used to evaluate the service level of access: a formal scaling technique such as psychometric (successive category) scaling, or the Stated Preference (SP) method, which is a subset of conjoint analysis. Though research is this area is not extensive, Ndoh firmly believes that monitoring the Level of Service of access services should provide airport managers with a tool to influence the access services at the airport concerned, and at the same time, enhance the air traveler's awareness of options of ground access.

Although issues pertaining to accessibility will not be explicitly addressed elsewhere in this thesis, the reader should just bear in mind that ground accessibility continues to be an important contributing factor that determines the distribution of passenger traffic at multiple airport systems. Indeed, accessibility ties in nicely with the definition of the "service area" for an airport within the multiple airport system, a definition that was mentioned in the first section of this chapter. However, this thesis will focus on the way airlines operating in a multiple airport environment compete for passengers.

CHAPTER 4

A WORD ABOUT COMPETITION

Before identifying the elements of competition in the airline industry since deregulation, one could first examine the definition of "competition". Such a momentary diversion would perhaps allow one to gain some useful insights into how competition may be analyzed.

4.1 Defining Competition

Though used often in everyday speech, the word "competition" seems to carry an extended definition in the minds of economists. The New Webster's Expanded Dictionary defines "competition" as a "contest for the same object; rivalry", and to "rival" is "to strive to excel; to compete with". As a first approximation, Donald Armstrong [20] at the Fraser Institute defines "competition" as simply "the performance of rivalrous acts."

However, Armstrong points out that Webster's definition limits competition to acts which are "under or as if under fair or equitable rules and circumstances" [20], while "rivalry" may include situations ranging from "benign to murderous" [20] moves. Therefore, the implication is that "competition" seems to carry a pleasant connotation while "rivalry", a pejorative one. To reconcile the two bi-polar connotations, Armstrong conveniently conceives of competition and its desirability as entities lying on an x-y plane whereby the relationship between competition and its desirability can be described as an inverted U as shown in Figure 4.11 on the next page.

Nevertheless, economists tend to take different stands when they have to define "competition". In particular, one group of economists - the Behaviorists - places much emphasis on what the competitors actually do, while the other group, namely the Structuralists, stresses the structure of the market, especially the number of competing firms. In short, the Behaviorists believe that a competitor:

- strives for improvement by innovation or imitation,
- chooses and offers choice (to the consumer),
- is independent and assertive (does not collude),
- plays and works hard in the competitive game,
- is knowledgeable of what others are doing,
- plays fair, and
- acquires and uses power to accomplish the above.

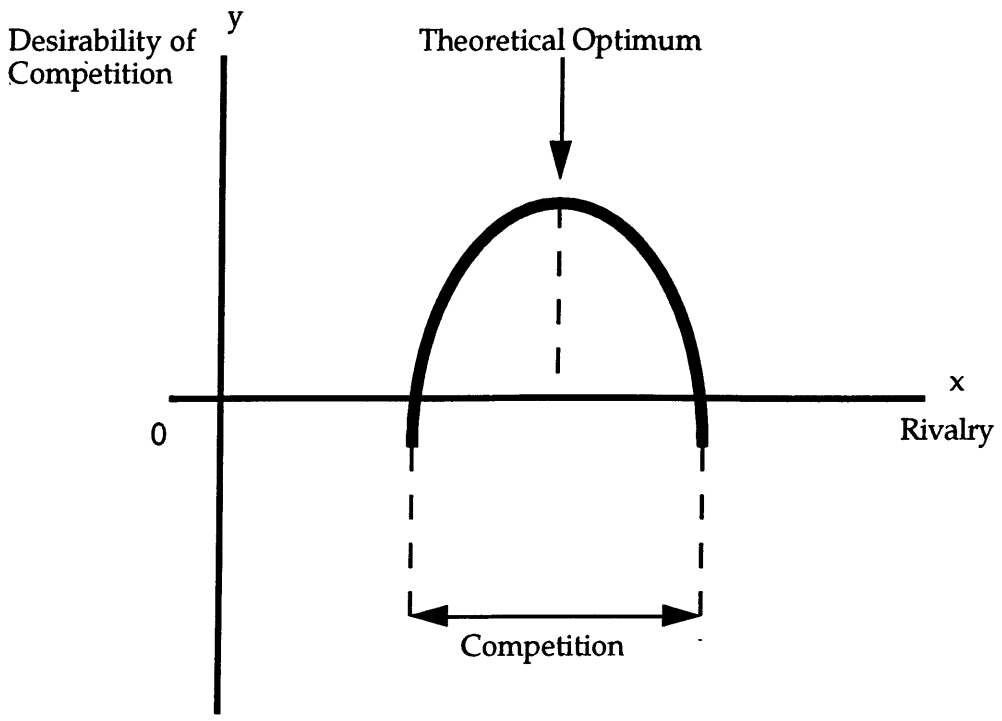


Figure 4.11 The Graphical Relationship Between Competition And Desirability [20].

The Structuralists simply adhere to the competition-number relationship, positing that competition amongst firms increases with the number of firms.

Despite the divergence in thinking, both groups tend to agree that choice is an important dimension of competition because they believe that competition and consumer welfare is a simple function of the number of competitors; the more competitors, the more competition, with infinity being seen by the Structuralists as the "perfect" [20] number of competitors.

With the basic economic definition of "competition" in mind, it is now appropriate to proceed with a fuller discussion of some of the characteristics of a competitor as put forth by the Behaviorists. Specifically, the first (improvement) and the third (independence) characteristics should be elucidated with some care.

Indeed, the impetus to improve by way of innovation or imitation is perhaps the central feature of competition. In fact, Armstrong believes that any change, be it grand or trivial, should be considered an innovation. In other words, contrary to popular belief, "innovation" should not be reserved for changes that work. Instead, dynamic competition does not consists only of one change, innovation or imitation but a continuous, undulating series of actions and reactions of the participants in the competitive game. An interesting point to note is that the matching of offers, a reaction

of an incumbent to a new challenger, would typically result in restoring some level of homogeneity of the product as the incumbent attempts to protect its previous market share, this being the case when the challenge appears successful as measured by the ensuing healthy sales and profits. Conversely, if some other dimension of the product is altered and this change is not matched by competitors, then heterogeneity sets in. Nevertheless, in either case, one can still say that all offers have improved in some way or another by nature of the fact that some change has occurred and that there is some demand for the altered services. Armstrong illustrates the characteristic offer-improvement or action-reaction process arising from the progressive leapfrogging by means of a set of perpendicular and parallel movements on a graph as shown in Figure 4.12 below:

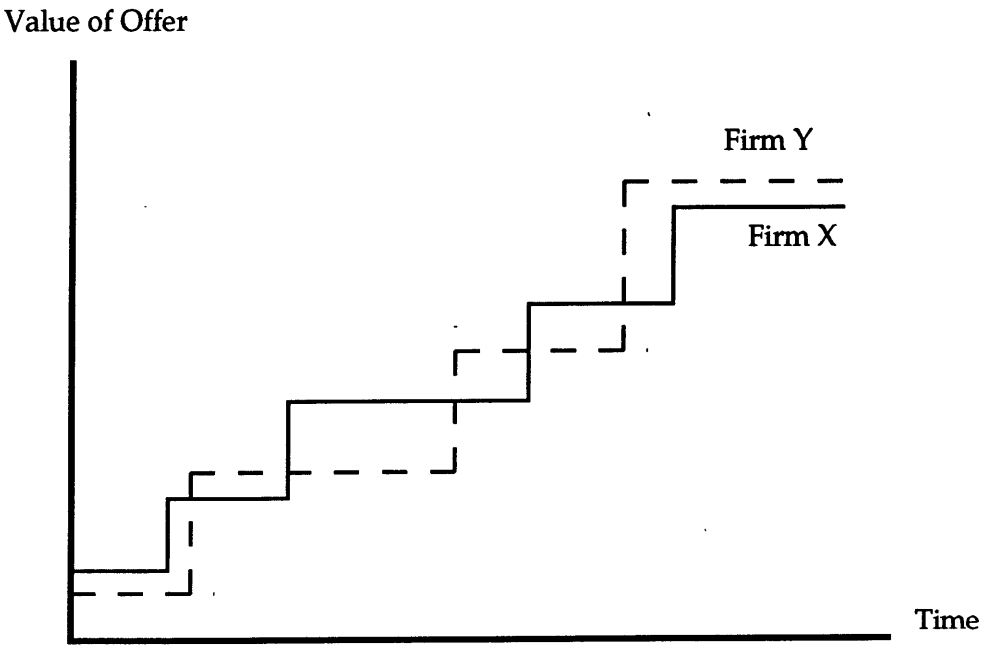


Figure 4.12 Action And Reaction Movements [20].

Indeed, the advantage of encapsulating the process as a series of parallel and perpendicular steps is that the benefit of competition may, in part, be judged by the gradient of the 'staircase', whereby one may readily see that the steeper the slope, the better the competitive performance. However, Armstrong was quick to point out that the innovative-imitative process must involve all price and non-price dimensions without distinction, and that every change is not necessarily an improvement for every participant in the competitive game. Accordingly, Armstrong believes that the

management of a firm should ensure that the changes also satisfy the needs of those other than the consumers; that is, the needs of employees, shareholders, suppliers and other participants should not be neglected. All in all, improvement should be offered to at least one of the participants in order for the change to be considered beneficial.

So far, "competition" conjures images of some distinct form of rivalry with others. However, one should realize that rivalrous behavior need not begin only with the arrival of a second firm or party. In fact, Armstrong argues that competition begins with the arrival of the first because the monopolist must continue to struggle with the alternative of zero. For example, cars must compete with horse-drawn carriages, typewriters with manuscript pens. In short, "...the present one must compete with past ones, potential ones, other ones, one's own past, one's dreams, and with zero." [20]

As mentioned earlier, one of the characteristics of a competitor is independent assertiveness. This translates to the idea that each competitor should strive to out-perform its rivals in the absence of any form of collusion (in accordance to The Sherman Act [21]). Although one would expect all participants in a race to aim for the coveted top position, one must also recognize that some will merely be striving to improve their relative position, while others will consider staying in the race as an overwhelming victory. Therefore, independent assertiveness can be defined as behavior that is consistent with the struggle to be "...relatively better, whether better than everyone else, better than some others, better than one's own past performance, or better than those who fail." [20]

Although the philosophical exposition on "competition" may seem rather abstract, the economic theory behind competition could later be useful in assessing the ills and benefits of airline competition. However, it is now appropriate to identify the elements of competition in the deregulated U.S. airline industry.

4.2 Airline Competition In The United States Since Deregulation

Prior to identifying the competitive variables for analyzing airline competition, it would be instructive to appreciate the competitive, deregulated environment for domestic U.S. airlines. While the following sections merely serve to highlight the main competitive strategies used by the U.S. carriers, the reader is encouraged to refer to the cited references for more detailed discussions on specific topics of interest.

The passing of the Airline Deregulation Act of 1978 essentially brought an end to federal control of air fares and routes, thereby allowing U.S. airlines to rapidly expand into new markets and abandon old ones which were deemed unprofitable. Based on economic theory, economists had predicted that deregulation would, in the

long run, lead to greater competition, lower fares, an enhanced level of air service, a reduction of operating costs, the elimination of monopoly on certain routes, and an improved overall efficiency of the airline industry [22]. Indeed, while the number of certificated carriers did increase from 44 to 114 between 1978 and 1984 [22], the airline industry as a whole was financially unsound during the early years of deregulation, largely owing to macroeconomic factors and the new deregulated economic environment itself. Specifically, the economic recession in 1980 and 1981-82; the air traffic controllers strike of 1981, which led to a reduction in air operations; a 90 percent constant-dollar increase in costs between 1978 and 1981 due to the hike in fuel prices, which in-turn forced airlines to raise fares; and the very intense competition in the early post-deregulation years were identified as the main factors that contributed to the dampened profits. Further, although deregulation stimulated productivity, operating costs outgrew growth in productivity during these early years.

Nevertheless, the progressive introduction of new marketing and operating practices since 1984 has taken the airline industry to new heights. Specifically, the three major developments that emerged over the past 10 years include:

- the reconfiguration of major carriers' route networks into hub-and-spoke systems;
- the adoption of several marketing practices which, to some extent, function as barriers of entry for rival airlines; and lastly
- the proliferation of new entrant carriers, including those that operate at a lower unit-cost and offer Spartan service at a low fare.

4.21 The Hub-And-Spoke System

Given the freedom to enter and leave a city-pair market, many of the major U.S. carriers recognized that route structure is a vital competitive strategy in itself [23]. Accordingly, the hub-and-spoke system evolved as the airlines, especially the U.S. majors, attempted to capture a larger overall market share by offering numerous one-stop connecting services - through hubs - to many city-pairs that would otherwise be served under a strictly linear route network at lower frequency. Indeed, airline managers believed that an efficient hub operation would gather sufficient traffic volume for the airline to offer more flights between a larger number of cities each day, thereby better matching air travelers' desired departure and arrival times. Additionally, a hub-carrier typically secures a large number of gates at the airport and handles sizable enplanement at that airport, as shown in Table 4.211 on the next page. One logical reason for such an observation, as suggested by Michael E. Levine [24], is that the hub-carrier would

Table 4.211 Percent Of Enplanement By Carriers At Major Hub-Airports [25].

HUB	Airline	1977	Airline	1984	Airline	1990
Atlanta	Delta	50%	Delta	52%	Delta	57%
Boston	Eastern	24%	Eastern	22%	USAir	18%
Charlotte			Piedmont	74%	USAir	93%
Chicago(O'Hare)	United	30%	United	46%	United	49%
Dallas/Ft. Worth	Braniff	34%	American	61%	American	63%
Denver	United	32%	United	40%	United	49%
Detroit	Delta	21%	Republic	29%	Northwest	69%
Houston (Int.)	Continental	37%	Continental	45%	Continental	77%
JFK (New York)	American	18%	TWA	21%	TWA	31%
LaGuardia (New York)	Eastern	31%	Eastern	32%	USAir	16%
Las Vegas	Western	27%	United	16%	America West	39%
Los Angeles	United	28%	United	22%	United	18%
Miami	Eastern	38%	Eastern	47%	American	20%
Minneapolis	Northwest	46%	Northwest	47%	Northwest	80%
Newark	Eastern	30%	People's Express	50%	Continental	48%
Orlando			Eastern	27%	Delta	31%
Philadelphia	USAir	22%	USAir	24%	USAir	46%
Phoenix	American	27%	Republic	19%	America West	46%
Pittsburgh	USAir	46%	USAir	77%	USAir	87%
St. Louis	TWA	40%	TWA	58%	TWA	79%
Salt Lake City			Western	71%	Delta	84%
San Diego			PSA	26%	USAir	19%
San Francisco	United	42%	United	37%	United	39%
Seattle	United	32%	United	28%	United	23%
Tampa	Eastern	31%	Delta	23%	USAir	28%
Washington (National)	Eastern	28%	Eastern	24%	USAir	21%

normally offer the largest number of nonstop services to the widest range of cities so much so that the name of the airline comes to mind first when an air traveler from that city is considering a trip somewhere. In short, the airline which has a hub in a particular city typically gains recognition as that city's airline, which therefore gives the airline a distinct marketing advantage over its competitors.

From an operational standpoint though, Atef Ghobrial has shown that there are both advantages and disadvantages of adopting the hub-and-spoke strategy [26]. Unlike the U.S. majors, Southwest Airlines has clearly avoided adopting the hub-and-spoke system for its fast-expanding network. Instead, it has tenaciously clung to the idea of offering high-frequency point-to-point short and medium-haul services, knowing that it has continually reaped sizable profits in the past by targeting the high-density short-haul markets. While Southwest does not go out of its way to create the well-coordinated arrival and departure banks that is so typical of any of the U.S. majors' hub-and-spoke operations, one may guess that with the large number of flights Southwest offers each day at certain airports, passengers may actually have the opportunity to create their own convenient connections to reach their final destinations, regardless of the number of transfer points they have to pass through.

4.22 Developments In Airline Marketing Practices

The four marketing practices responsible for altering the competitive scene of the U.S. airline industry include:

- the creation of innovative frequent flyer programs (FFPs),
- the advent of powerful Computerized Reservations Systems (CRSs),
- the implementation of revenue management, and
- the widespread practice of paying travel agent commission overrides.

4.221 Frequent Flyer Programs

First introduced in 1982 by American Airlines, frequent flyer programs are intended to increase brand loyalty based on the idea that the more flights a passenger takes with an airline, the greater the future rewards. Although nothing prevents a passenger from participating in more than one program, the awards are usually constructed in such a way that exclusivity is encouraged. A passenger who resides at an airline's hub-city would clearly see the benefits of flying the hub-airline because the airline has the most impressive route network emanating from that airport. Thus, a hub-airline's attractive FFP can deter entry by a challenger as the offer of lower fares and skimpy mileage credits by the challenger may be a relatively weak pull for the already

loyal customer of the incumbent airline. In an era where the airline of the future is possibly one that has significant "global reach" [27], one could readily envision that the linking of FFPs, arising from marketing alliances and/or code-sharing agreements between U.S. and foreign carriers, could potentially offer the air traveler an even wider range of business and vacation destinations, thereby reducing the air traveler's need to switch brands. The fact that airlines, to some extent, attempt to match FFP privileges adds yet another dimension to competition.

Steven Mitsuo Nako's [28] recent empirical study on the effects of frequent flyer programs on business travel revealed that such programs do have a significant effect on the choice of airlines, and that the "hub effect" is significant as well. Quantitatively speaking, Nako discovered that an increase of 10% in a carrier's airport market share enhanced the effectiveness of that carrier's frequent flyer program by about $4.80 [28]. Although Nako does not advocate public policy options against such programs, he recommends further research in areas such as the cost of travel awards and the degree to which these programs actually generate trips.

An example of a detour from the norm is, once again, Southwest Airlines. Even though Southwest does not have a vast global network - it does not operate internationally - or a well-defined hub-and-spoke operation within continental U.S., it too offers a unique FFP, called The Company Club, which entitles passengers to earn one round trip ticket after having flown 16 one-way flight segments with them [29]. While little is mentioned about the popularity of Southwest's FFP, Table 4.2221 below indicates that, in 1991, American Airlines led the U.S. majors in FFP enrollment.

Table 4.2221 Frequent Flyer Program Membership In 1991 [25].

Airline	**Frequent Flyer Program Membership**
American	14.2 million
United	13.3 million
Delta	10.1 million
Continental	9.1 million
Northwest	8.6 million
USAir	7.8 million

All in all, airlines, over the years, have become highly innovative in inducing their customers to earn frequent flyer points. In fact, given that airlines have struck agreements with such organizations as long-distance telephone companies, hotels, car-

rental agencies, and credit-card companies, one does not really have to physically fly with the airline in order to accumulate the necessary qualifying points for the coveted awards.

4.222 Computer Reservations Systems (CRSs)

Before deregulation, about two thirds of airline bookings in the United States were made directly with airlines, but by the mid-1980s, some 80% of the bookings were made via travel agencies [25]. As shown in Table 4.2221 below, the percentage of CRS equipage has increased tremendously since 1977- from a low of 5% in 1977 to 95% in 1987 - even though there was an in tandem increase in the number of travel agencies.

Table 4.2221 Percentage Of Agents Using CRSs [25].

Year	Number of Agents	% With CRS
1977	13,454	5
1979	16,112	24
1981	19,203	59
1983	23,059	85
1985	27,193	90
1987	29,370	95

However, Williams [25] believes that the impact of CRSs on the airline industry would not have been so noticeable had more carriers developed their own systems because Williams is convinced that the CRS market has been dominated by just two companies - American Airlines and United Airlines, as Table 4.2222 shows:

Table 4.2222 CRS Market Shares in 1985 [25].

System	Vendor(s)	% of Location	% of Agency Generated Revenue
Sabre	American	35	46
Apollo	United	24	28
Pars	TWA/Northwest	13	10
System One	Texas Air	17	10
Datas II	Delta	10	5

Additionally, despite a declining share of agency locations, these two carriers, until recently, have accounted for over 70% of the revenues generated by agency CRSs,

because these two firms had targeted the larger firms long before other players recognized the potential impact of the CRSs. The fact that by 1986, the five remaining CRSs of Sabre, Apollo, Pars, System One, and Datas II, accounted for 88% of all airline tickets sales in the U.S. is a clear indication of the power of the CRSs [25].

Perhaps the controversial issue of CRS screen-bias, whereby the airline that owned the CRS would usually preferentially list its own flights, elevated the intensity of competition on the screen. Another problem is that agents using a particular airline's CRS have a propensity to favor the airline owning the CRS because such airlines maintain supportive business relationships with their network of agents. With the CRS-owning airlines making a conscious attempt to sign-up most of the agents in the area served by hub airports, one is not surprised to discover that the hub-airlines receive a disproportionate share of the reservations. Perhaps the most formidable barrier for a potential challenger at the hub-airports is the insidious effect of the additional cost incurred for each booking received. Finally, the rapid advancement in information technology has more recently created the disputed practice of computer price-signaling, which takes place when fares are sent to the Airline Tariff Publishing Company, the airline industry's clearinghouse for fares [30].

4.223 Revenue Management

Revenue management, which Louis Busuttil at Cathay Pacific Airways defines as "the integrated control of price and capacity to maximize revenue" [31], has been one of the most potent instruments used for fare competition by U.S. airlines. In particular, a powerful revenue management system has been known to grant the larger incumbents some flexibility in the event that it is threatened with lower fares offered by hostile challengers. With selective fare-matching being a distinct option, the incumbent can reduce serious traffic diversion (and revenues) to the new entrant. While research documents revenue gain with effective price and capacity controls, revenue management on its own should not be seen as an omnipotent panacea for an airline's financial woes. Far from it, Busuttil believes that the key to successful implementation of revenue management lies in the availability of quality past traffic data as well as the integration of marketing, advertising, flight scheduling, and aircraft utilization. Indeed, revenue management has gone beyond just the control of price and seat capacity alone, as was originally intended.

George Stearns and Michael Westervelt [32], bent on dispelling the common notion that airline pricing is of "secondary importance" to revenue management, firmly believe that revenue management techniques are effective only when pricing strategies

and tactics are "smartly designed and effectively executed." The article, which explains the dynamics of airline pricing and the varying tactical pricing strategies that airlines exploit to gain a competitive advantage, does however, highlight the four major goals of the revenue management analyst: to minimize (1) low yield revenue spill, (2) high revenue spill, (3) the cost of spoiled seats, and (4) the cost of denied boardings. The two-fold responsibility of the pricing staff, on the other hand, is: to monitor, analyze, and respond to the thousands of daily fare changes implemented by competitor airlines; and to routinely develop pricing initiatives to strengthen the airline's position in the marketplace. One point to note, though, is the airlines' ironical practice of offering "off tariff" (unpublished) fares, because the Air Traffic Publishing Company fare clearinghouse is so efficient in communicating fare changes that this denies any airline the ability to exert a "meaningful" price advantage. Stearns and Westerfelt believe that airlines will continue to practice this not only because airlines continue to seek a fare advantage, but because "chronic overcapacity" [32] in the industry will induce airline managers to fill surplus seats. They conclude with a comment that with pricing becoming more complex and challenging as the years pass, pricing, though "part science, part art" [32], will be recognized as the "equal" of revenue management in terms of its impact on the airline's overall revenue performance. Regardless, their main message is that with whatever sophisticated technology an airline can use to deal with pricing on a daily basis, the ultimate goal of the airline is still to maximize the airline's overall profitability, and that in the current deregulated environment, fare competition is something that airlines must contend with.

4.224 Travel Agent Commission Overrides

As commission overrides raise the marketing costs of the airlines paying them, one readily recognizes that the same payment is a larger proportion of the new entrant's total cost compared to that of an established incumbent. Hence, one may infer that the airline that is most able to pay the handsome overrides is likely able to capture the revenues and hence stay ahead in the race. Thus, the established incumbent, with its existing huge sales volume, can effectively ward-off potential challengers by justifying such an outlay to protect its market share.

4.23 New-Entrants

In recent years, the proliferation of low-cost entrants which offer reduced amenities has received significant attention primarily because the major airlines fear that these low-cost entrants may become just as successful as perennially profitable

Southwest Airlines, a well-established low-cost carrier that has been offering low fares since the 1970s. With its strategy of tapping short-haul, high origin-destination traffic niche markets at less-congested airports by offering high frequency services, Southwest has proven the traditional majors wrong in upholding their prevalent thinking that bigger is better, and that hub-and-spoke systems are a must to stay competitive in the airline industry. With Southwest fast becoming a major player in an increasing number of high-density markets, some of the traditional full-service airlines have resorted to cloning Southwest, notably Continental Airlines, USAir and United Airlines, with United leading the pack in fighting head-on with Southwest in selected West Coast markets [33]. Indeed, both Southwest and Midway Airlines are fine examples of carriers that have sizable operations at multiple airport systems, and evidently believe that less-congested airports (e.g. Hobby, Love Field, Midway) should not be ignored even though the majors continue to maintain a strong presence at the primary airport of the urban area.

Nevertheless, the rapid entry of new entrants is a phenomenon which should not be taken too lightly. Specifically, since 1992, the Department of Transportation has authorized 28 airlines - many of them low-fare carriers - and 11 more applications are pending [34]. This is a record number of new entrants within a two year period since the industry was deregulated in 1978. Some claim that with the demise of three major carriers in 1991, coupled with the downsizing of the surviving majors, the current climate is perhaps conducive for launching new carriers [34]. Even with the Air Transport Association's estimates that new entrants carry less than 2% of the total scheduled passengers in the U.S., the majors view new entrants as "a credible threat" [34] because the majors usually have to match the low fares. Newark-based Kiwi International, for example, claims that even though it has only captured 5% of the Newark-Chicago market, it has saved passengers more than $200 million to date based on its prevailing fares [34].

However, consumers must reconcile with certain advantages and disadvantages of using the services of these start-ups. On one hand, new entrants offer low fares with few restrictions on nonstop point-to-point services, and often to convenient downtown airports, but these new entrants typically fail to match flight frequency, may not have a frequent flyer program, and usually offer limited amenities and services. Some new entrants have even opted against participating in CRS network, and most do not offer commission overrides. Optimistic that start-up carriers are here to stay, Robert Harrell, vice president of American Express' airfare management unit [34], claims that there are

probably "other 2,000, to 3,000 city-pairs just in the East" that can still be exploited by new start-ups.

4.3 Other Barriers To Competition

Aside from the several marketing practices that have shaped airline competition, technological barriers also dictate whether an airline can or cannot enter the competitive game. For example, since the passing of the Airport Noise and Capacity Act of 1990 [35], airlines are expected to phase-out Stage II aircraft and replace them with quieter Stage III or retrofitted Stage II aircraft by 2000, which ultimately induces airlines to renew their fleets accordingly in order to remain in the industry. To this end, one may add that the airlines that have the financial resources are able to afford newer, more fuel-efficient Stage III aircraft while new entrants, which usually pick-up older aircraft for cost-saving reasons may have to re-examine their fleet acquisition alternatives should they wish to continue operations. Then, slot restrictions at J. F. Kennedy, LaGuardia, Washington-National, and Chicago O'Hare Airports could potentially curb an airline's expansions plans and possibly bar new entrants from even starting operations at such congested airports.

All in all, while pro-and anti-Deregulationists continue to disagree with the benefits and evils of deregulation [36], it is clear that deregulation has in more ways than one, revolutionized the nature of competition of the domestic U.S. airline industry. While few countries outside the U.S. have completely embraced the economic ideology, the U.S. airline industry remains an excellent test-bed that offers a plethora of opportunities for analyzing competitive behavior of airlines at multiple airports systems. As one can see, competition between airlines is now multi-dimensional, going beyond just price and capacity. Yet, to capture competition at a rudimentary level, it may be instructive to select the more quantifiable variables of competition, notably fares, and frequency.

CHAPTER 5

METHODOLOGY OF RESEARCH

In conducting a very preliminary, exploratory study of the competitive behavior of airlines at multiple airport systems, the author would like to point out that the immediate use of sophisticated econometric methods should be avoided as it may be more revealing to first firmly grasp the qualitative aspects of the competitive dynamics. Even at the onset, one might suspect by now, based on the discussion in the previous chapter, that the multi-dimensional nature of competition does not allow one to hastily throw the isolated variables into a magical mathematical 'black-box' from which some predictive quantitative relationship may be derived. Thus, while a good model of airline competition is valuable, the author will defer the pursuit of such lofty ambitions until the fundamentals of airline competition are well understood. Accordingly, the primary research methodology consists of an anecdotal analysis of the competition between airlines operating between selected airport-pairs, the aim of which is to expose the variety of ways airlines operating at multiple airport systems deal with the entry and exit of challengers. If consistent trends are observed, the study may be considered 'positive'; if not, the study could be classified as 'neutral', in which case one could tentatively conclude that the competitive behavior is indeed very complex.

The current chapter identifies the competitive variables which will be used for the study, provides brief background information of the candidate multiple airport systems, describes the four generic competitive scenarios, discusses the data sources and how the city-pairs are chosen, then concludes by explaining the method of analysis.

5.1 Identifying The Competitive Variables

The extended discussion in the previous chapter has highlighted the multi-dimensional nature of airline competition in a deregulated environment - such as that in the United States. Consistent with the ideas described in section 4.2, Charles F. Banfe [37] identifies three major competitive variables: (1) schedule, (2) routes, and (3) pricing; and six minor competitive variables: (1) frequency, (2) equipment, (3) service, (4) accessibility, (5) loyalty, and (6) perception.

Scheduling is an important competitive variable in so far as airlines aim to maintain a delicate balance between operational and marketing objectives. The former objective refers to an airline's goal of increasing aircraft and crew utilization as a way of

reducing unit operating costs [38], while marketing objectives refer to the need to satisfy passenger demand and, at the same time, achieve some reasonable load factor.
The importance of route strategy has already been discussed in section 4.21. However, Banfe goes as far as explaining the impact of the hub-and-spoke, in-line (linear), and grid networks on factors such as marketing, aircraft utilization, weather-related delays, load factor, and station density. Yet, of all the three major competitive variables mentioned, Banfe considers pricing the most "intriguing", with the justification that airline managers now have to grapple with the huge array of fare classes and how competitively priced one fare-type is with respect to competitors.

As a minor competitive variable, frequency actually refers to more than just the physical number of trips an airline offers each day or each week because air travelers also consider the time of departure and arrival of flights. As early as 1968, N. K. Taneja, who had closely studied the S-shaped market-share-frequency-share curves [39], quoted Scharlach's (of Deutsche Lufthansa) work on the time-of-day preference of both business and leisure travelers for same-day return trips between German cities. Starting off with the hypothesis that different times of a day have different "distinct values" for a person, Scharlach discovered that, in accordance with psychological and professional imperatives, mornings are preferred departure times to a destination while evenings for the return trips for both business and non-business travelers [39]. Taneja incorporated this time preference in the model by introducing a time value coefficient, with a highest coefficient of 4 assigned to the unfavorable times of 6-7am and 10-11pm, and a coefficient of 2 for other "marginal categories" [39]. The optimal time zones of 8-9am and 6-8pm are assigned a coefficient of 1 since a penalty is not incurred. Although such a factor was incorporated into established models, it did not unseat the notion that an airline's market share of origin-destination traffic between two points is largely determined by the relative frequency share.

The quality and type of equipment used is seen as a competitive variable if one accepts the assumption that air travelers prefer the newest, most comfortable aircraft available - if given a choice. An airline's use of older equipment has implications for passengers' perception of safety. In recent weeks, the safety of commuter air travel has come under attack by the media, bringing forth the issue that small airplanes, typically turboprops with fewer than 30 seats, abide by lower standards of safety than larger jets, in part due to the differential pilot experiences [40].

Banfe's definition of "service", the third non-major variable, is limited to the quality of ground and on-board service, which in-turn, encompasses an entire arena of less tractable variables. However, airlines have tended to be highly innovative in their

desperate attempts at attaining fine gradations of product differentiation. In recent months, Adam Bryant writes, in The New York Times, that airlines have been "experimenting as never before" with new kinds of frills that may help fill otherwise empty seats [41]. For example, Northwest Airlines is serving a moving buffet on most flights instead of the traditional standard meal on trays. Thus, for a hearty breakfast, passengers are given the liberty to devour unlimited portions of bananas, bagels and sandwiches. A more unusual innovation is Midway Airlines' designation of certain toilets for women, while United Airlines, for its high-frequency *Shuttle* services in the West Coast, boards passengers beginning with those with window seats so as to ease congestion along the aisle during the boarding process. Then, Continental Airlines decided to describe all its inflight meals - less those on the transcontinental services - as "snack" so that passenger would be pleasantly surprised if they were served a full meal but would not be disgruntled if served peanuts and pretzels. Delta Air Lines and Southwest Airlines are testing the "ticketless" system whereby the fare is charged directly to the passenger's credit card once he or she inserts the card through an electronic reader. On the whole, despite what surveys have to say about passenger preferences for inflight amenities and service, it seems that airlines cannot completely ignore the swaying opinions of air travelers because the slight competitive edge could well mean the difference between profitability and otherwise.

Convenience of airport access is particularly important when considering multiple airport systems, as Banfe points out. He does see airlines choosing more conveniently accessible airports as a means of gaining a competitive edge. Loyalty, which an air traveler may develop for many reasons, enters the overall competitive picture in the way air travelers choose between airlines. Lastly, Banfe defines "perception", the sixth minor variable, as the sum of all the variables as perceived by the air traveler; that is, the air traveler will usually identify a carrier as one that has the most desirable schedules, the highest frequency, the lowest prices, the best ground and on-board service, the newest equipment, and the most able to instill loyalty. Whether this perception is real or imagined, Banfe believes the air traveler's perception is still a strong motivating force behind which airline the traveler will ultimately fly.

Despite the detailed enumeration of all these competitive variables, only a few competitive variables are easily quantifiable in practice: average fares, frequency, and capacity (total seats offered). Detailed fare information is usually stored in the airline's reservations systems, but if the specific fare stratification is not available, one would have to be content with average fares, which in itself, is not a poor indicator of the actual fares for a given market because fare matching is a common practice. Frequency

and the number of seats offered are, in essence, what an airline produces and is usually published in flight schedules or in the Official Airline Guides. However, given that airlines may exploit a myriad of competitive variables to achieve some level of product differentiation, Banfe believes that optimal use of such variables is critical for an airline's overall success. In short, to keep the analysis of competitive behavior of airlines simple for this preliminary study, it is adequate to just consider fares and frequency as directly quantifiable and obtainable competitive variables. In addition, the author will take the distance between the airport and the center of the city as a simple guide to 'measure' accessibility. With reference to the definition of the multiple airport system mentioned in Chapter 3, the most preferred airport will be the airport that is nearest the center of the city.

5.2 Selecting The Multiple Airports For The Study

To keep the study as simple as possible for this preliminary study, the author is considering only dual-airport systems within the United States. Dual-airport systems outside the United States will not be considered because the current study aims at understanding the competitive behavior of airlines that operate within a deregulated environment. Accordingly, the candidate dual-airport systems considered are those at Detroit, Chicago, Dallas, and Houston. Of these four, two will be selected for the study. A brief history and the main features of each of the four airports will be provided in the following paragraphs.

In 1947, the City of Detroit forced all commercial traffic to move from the smaller Detroit City Airport to Wayne County International, which is 25 miles further away from the city center. Indeed, until the late 80s, almost all commercial traffic was concentrated at the bigger airport, which has become one of Northwest Airlines' major hubs. The advent of Southwest Airlines into the smaller Detroit City Airport in 1989, which subsequently revived activity at the airport, essentially made Detroit a multiple airport city, with Southwest offering nonstop services to Chicago-Midway, Indianapolis, and St. Louis. However, despite increased service to the smaller airport, service here remains limited and is restricted to short haul flights because of the short runway and neighborhood opposition to elevated noise-levels. As the competitive behavior of airlines at both the airports is highly biased towards the entry of essentially just one carrier - Southwest - at Detroit City Airport, the dual-airport system of Detroit is perhaps not the most ideal example to use for the current study.

The two airports of Dallas/Fort Worth International (DFW) and Love Field have had an estranged relationship since the opening of DFW in 1974. Specifically, in

response to the 1964 Civil Aeronautics Board order that the cities of Fort Worth and Dallas build a joint airport, the two cities agreed to close both Love Field and Greater Southwest Airport when DFW opened. However, then upstart Southwest Airlines waged and won the battle to remain at Love Field, for which it now enjoys a monopoly as a result of the passing of the Wright Amendment of 1979 [42], an Amendment that was passed at the behest of then House Speaker Jim Wright of Texas to protect the revenue stream that was paying-off the bonded-indebtedness that built DFW. Although the law bans nonstop or direct flights between Love Field and any city outside Texas and the four contiguous States of New Mexico, Oklahoma, Arkansas, and Louisiana, many savvy air travelers have cleverly circumvented the law to take full advantage of Southwest's low fares by purchasing separate tickets to go to destinations beyond Texas' four contiguous States. Southwest remains "totally neutral" with regard to the repeal of the Wright Amendment, although a 1991 academic study christened the Amendment "an outdated legislature relic that restricts competition, consumer choice, hinders economic development and imposes undue costs on the flying public." [42] Indeed, Southwest welcomes competition at Love Field - which it did have when Muse Air and Texas International were still around in the early 80s. More recently, the importance of Love Field as Southwest's sanctuary is overrated because Southwest has seen more growth at Chicago-Midway and the California Corridor than at Love Field. In any case, Southwest does not have an interest in serving neighboring DFW because it would have to charge higher fares in order to cover the cost of congestion for its characteristic quick-turnaround operations. While some advocate that Love Field's land area of 1,300 acres is a prime alternative for alleviating congested DFW's overflow problems, others fear that as the two airports are only 6.5 miles apart, airspace capacity and safety concerns can only impose constraints on Love Field's expansion. Even with Southwest's presence and commitment to Love Field, DFW has launched a $3.5 billion expansion plan to anticipate the predicted doubling of passengers to 104 million by 2010 [43]. Nevertheless, as competition at the dual-airport system at Dallas/Fort Worth is somewhat restricted due to Southwest's monopoly at Love Field, the dual airport system at Dallas/Fort Worth will not be chosen for the study.

Another multiple airport city of interest is that of Houston. The change-over from Houston-Hobby to Houston-Intercontinental took place in June 1969. As shown in Figure 5.21 on the next page, Hobby Airport, which is off Interstate 75, or 3 miles off the circumferential Interstate 610, is only 12 miles southeast of downtown Houston, while Intercontinental Airport, which is 23 miles north of downtown, is located between Interstate 75 and 59, and off the North Belt (which connects two highways). Other than

the fact that it may take longer to reach Intercontinental from the city-center, Intercontinental is easily accessible from both downtown and the area in which most travelers reside.

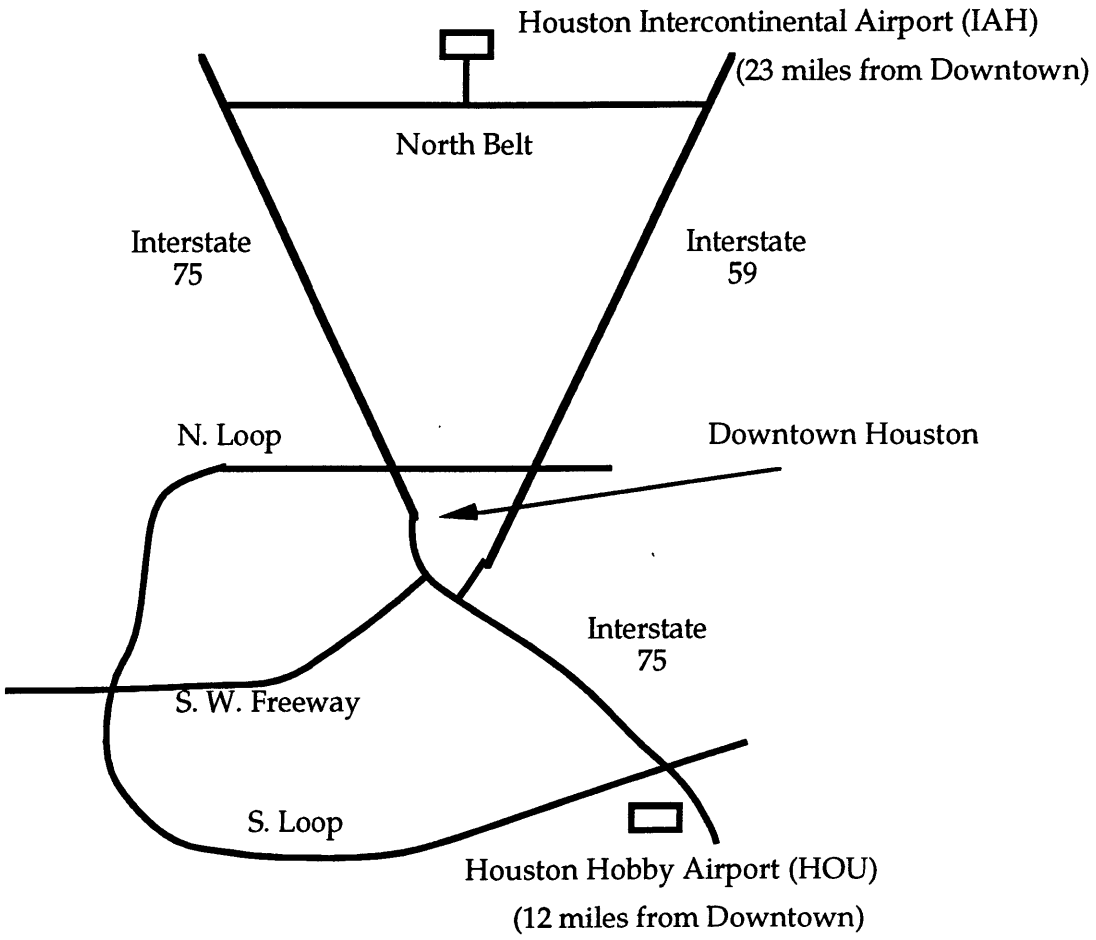


Figure 5.21 The Location of Houston's Hobby and Intercontinental Airports [9].

Although Hobby was closed immediately after Intercontinental opened in the summer of 1969, both Hobby and Intercontinental are used by airlines today. In fact, a check with the Official Airline Guides of October 1994 revealed that five airlines - American Airlines, Delta Air Lines, Northwest Airlines, Southwest Airlines, and Trans World Airlines, had operations at Hobby Airport, with Southwest Airlines offering the most departures. Continental Airlines, on the other hand, established a sizable hub at Intercontinental. As several airlines other than Southwest have had a presence at Hobby over the years since deregulation, Houston's dual-airport system will be chosen for use in this study.

Lastly, much may be said about the two airports at Chicago: O'Hare and Midway. For being decidedly the busiest airport in the United States, O'Hare is not liked for its noise, but politicians, business parties, many citizens, United Airlines, and American Airlines "love its economic payoff and flight frequencies." [44] Unfortunately, O'Hare's reputation is tainted by its problems with ground access. Specifically, the airport has one exit and one entrance for the 100,000 vehicles per day that serve the airport, and the train that serves the airport makes numerous stops at sparsely populated areas on the way from downtown. The slot problem is less of a headache than most think as there are ways around it by exceeding the high-density rule during good weather. To increase its operations at O'Hare, American, which loses to United's share of departures by about 7% [44], had considered converting some of its jet-slots to commuter-slots. However, so serious is the congestion in the airspace around Chicago that carriers that operate at O'Hare consider Midway "an awful disease" [44] because many southbound flights mesh with Midway's traffic. American, in particular, is waging a war against operators at Midway. Yet, traffic at Midway has not diminished, particularly when Southwest is planning to increase operations to 100 daily flights by 1995, and that TWA is moving its operations there [44]. The solution to some of O'Hare's problems is linked to a politically controversial idea of building a new 9,400 acre airport at Lake Calumet [44]. With this new airport in-place, Midway may be closed to commercial traffic but continue to serve general-aviation traffic, replacing the current downtown Meig's Field, which would close. While Lake Calumet does not signal the death of O'Hare, American will continue to fight for more slots to catch-up with United. Indeed, even though both United and American combined already have the majority of the slots at O'Hare, both are determined to take more if they can. Therefore, with Midway Airlines competing with the two giants at O'Hare during the 1980's -until it folded in late 1991 - the dual-airport system at Chicago is a prime candidate for case studies.

Thus, with the dual-airport systems of Chicago and Houston selected for the study, it is now appropriate to define the scenarios under which the competitive behavior amongst the airlines takes place.

5.3 The Four Competitive Scenarios

Based on a comprehensive quarterly tracking of the services into and out of Chicago's O'Hare and Midway Airports, as well as those at Houston's Hobby and Intercontinental Airports over the 14 years (1979 to 1993), the author observed that the airlines' services exhibited discernible patterns of routing, thereby indicating that the

airlines compete under a fairly well-defined structured environment. Analogous to plant and animal taxonomy, one can identify a total of four competitive scenarios, each of which is described with the help of a diagram in the following sub-sections. After describing the four competitive scenarios, details about the choice of airport-pairs for analysis will be given. Although the scenarios described below consider only dual-airport multiple airport systems, the reader should bear in mind that this classification may be extended to multiple airport systems with more than two airports. As a matter of terminology, each airport is a host to some airline (labeled as Airline A, B, C...), and an airline that has maintained service since the first quarter of 1984 is considered an "incumbent", while a "challenger" is one that introduced a service in the same or the parallel market at any time after the first quarter of 1984 but before the second quarter of 1993.

5.31 Scenario 1: MAS<->Non-Hub Destination

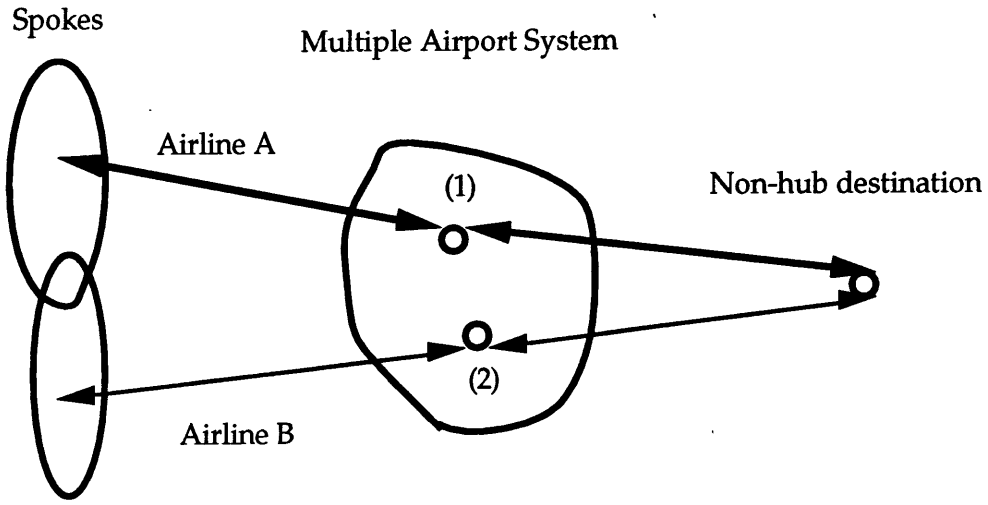


Figure 5.311 Scenario 1: MAS<->Non-Hub Destination.

As shown in Figure 5.311 above, airlines in Scenario 1 offer parallel services between the multiple airport system (MAS) and some non-hub destination that is common to both airlines. Typically the airline is based or has a sizable hub at one of the airports within the multiple airport system, and is able to capitalize on the huge feed from the rest of its network that emanates from the multiple airport system to support the existing origin-destination traffic between the multiple airport and the non-hub destination. Thus, in this very simple case, the airlines are competing for origin-destination traffic and connecting traffic.

5.32 Scenario 2: MAS<->Hub Of Challenger

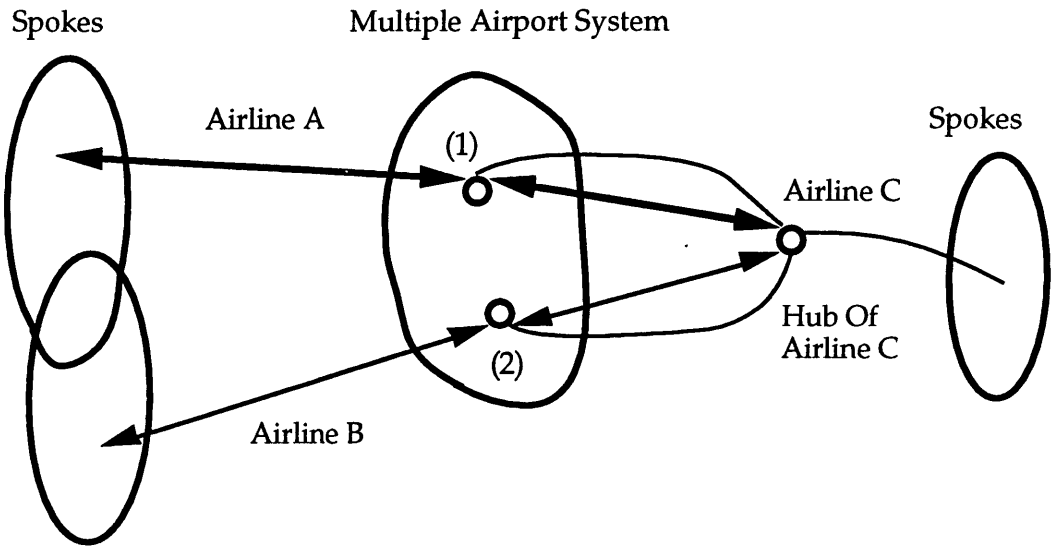


Figure 5.321 Scenario 2: MAS<->Hub Of Challenger.

Scenario 2 provides an example of hub-to-hub competition, a scenario which has become significant since the reorganization of many airlines' route structures into efficient hub-and-spoke systems. Here, Airlines A and B, which are based at the multiple airport system, view Airline C's hub as an end-point, while Airline C, a challenger, views the MAS as part of its extensive spoke system. One reasonable conjecture is that Airline C is tapping both the connecting traffic through its hub and the origin-destination traffic between its hub and the MAS.

5.33 Scenario 3: MAS<->Hub Of Incumbent

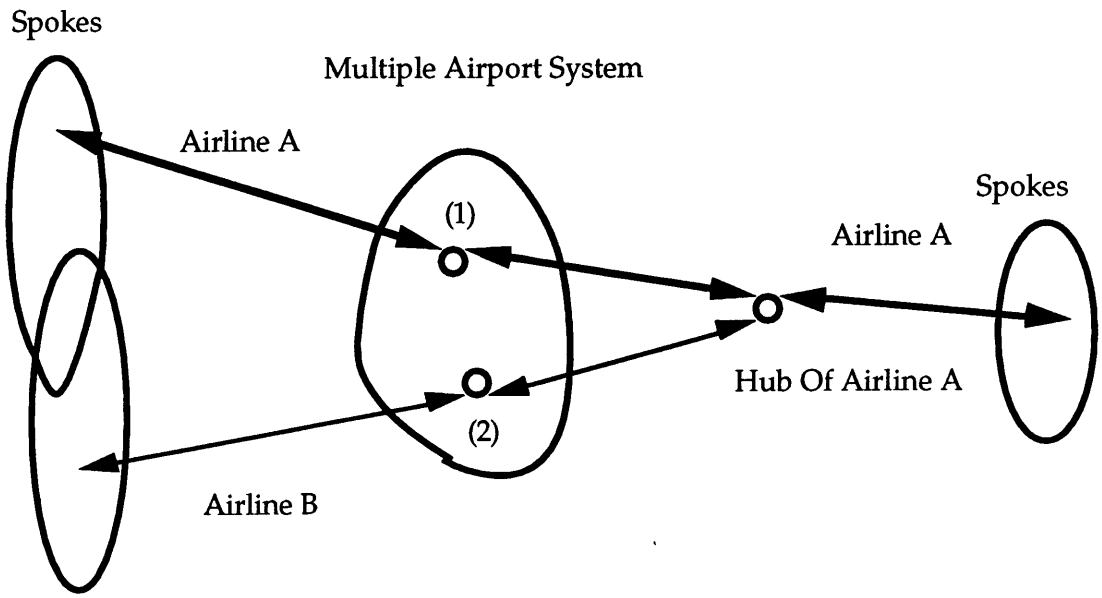


Figure 5.331 Scenario 3: MAS<->Hub Of Incumbent.

This is a variation of the previous scenario whereby either Airline A or B operates a dual hub system, with one hub located at the multiple airport system. Thus, the MAS may be seen as a spoke for the airline's hub-operations at the hub outside the MAS, while the hub outside the MAS is seen as a spoke for the airline's hub-operations at the MAS. With such a route network, one may postulate that such an airline will most probably capture a sizable share of the origin-destination and non-origin-destination traffic between the two hubs, thereby posing a serious threat to any challenger.

5.34 Scenario 4: MAS<->MAS

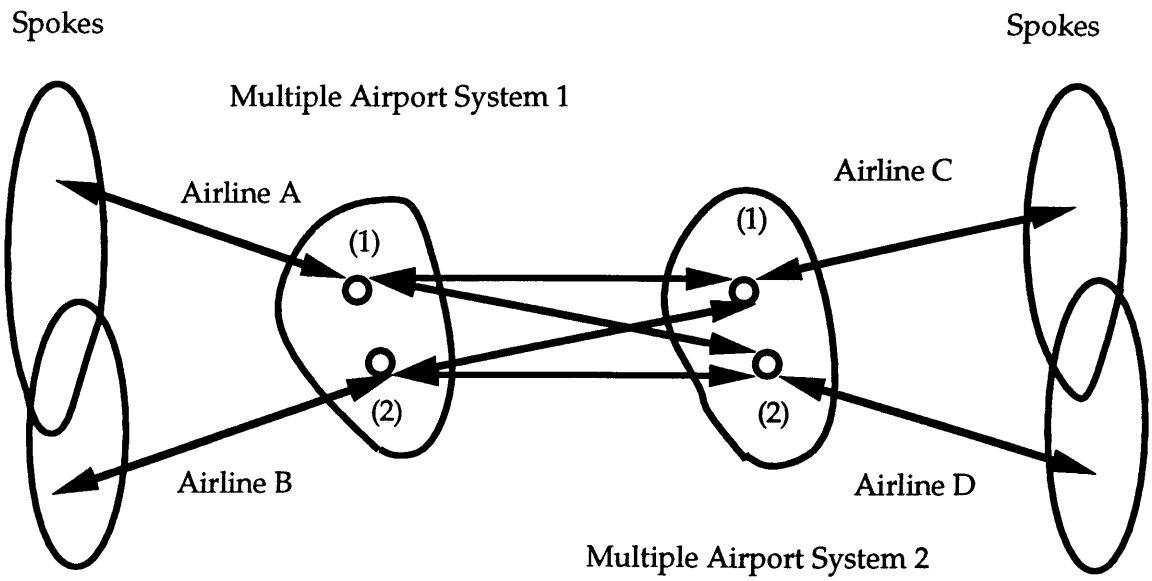


Figure 5.341 Scenario 4: MAS<->MAS.

In the last of the four scenarios, one may examine the competitive behavior of airlines operating between multiple airport cities. Specifically, airlines that offer flights to and from more than one airport in either of the multiple airport cities would be of interest. It is likely that the origin-destination traffic between the two multiple airport cities is huge enough for an airline to justify offering service from more than one airport in the same urban area.

While the four scenarios described may not be an exhaustive list of scenarios, the reader should be aware that the four scenarios are simple classification 'templates' under which one may analyze the competitive behavior of the airlines serving the multiple airport system. The scenarios, contrived on the basis of observations, are merely meant to describe the general pattern of air service at multiple airport systems; exceptions do abound.

5.4 Data Sources And Selection Of Airport-Pairs

The primary sources of data are: the Official Airline Guides - North American Edition [45], and *O&DPLUS* [46] and *ONBOARD* [47] database products. Statistics found in both *O&DPLUS* and *ONBOARD* are derived from information regularly submitted to the U.S. Department of Transportation by airlines on Form 41 and C298. While Database Products, Inc., the company that produces the software, does warn users of the reliability of the data it provides, the data is sufficiently accurate for such a preliminary study of airline competition. *O&DPLUS*, as the name implies, provides average fares and total traffic for a specified origin-destination airport-pair, while *ONBOARD*, the total frequency of nonstop services between two specified airports, the total number of passengers on the aircraft that flew nonstop between two specified airports, and the total number of seats offered on these nonstop services.

Selected editions of the Official Airline Guides were consulted for the initial part of the research which involved just tracking the pattern of air services at Chicago (O'Hare and Midway Airports) and Houston (Hobby and Intercontinental Airports) from 1979 to 1993. Although the Flight Transportation Laboratory at MIT stocks only the March, June, September and December editions of the Official Airline Guides to best represent the four quarters of each year, the initial tracking of the pattern of air service was quite complete despite the missing months. To ensure consistency in the quality of service offered by the participants in any one market, only cities that were served nonstop from both airports in the multiple airport system were included. For example, the city of Omaha in Nebraska was linked to both Chicago-O'Hare and Chicago-Midway during the mid-80's by way of several nonstop services each day. With this criteria, a large number of the city-pair markets found were either short-haul or medium-haul. Subsequently, the airport-pairs could then be classified, in accordance with the specific features of each of the four competitive scenarios, after which the appropriate airport-pairs could later be selected using a different set of criteria.

The set of criteria used to select the airport-pairs for study was dictated largely by the serious limitations of the data sources. Specifically, data from *O&DPLUS* spans from 1979 to the second quarter of 1993, while that from *ONBOARD*, 1984 to first quarter of 1994. As such, the period of interest for this study is limited by the window between the first quarter of 1984 and the second quarter of 1993. Ideally, airport-pairs for which the challenger enters in the mid-80s would be prime candidates. For having selected a time window of just over nine years, one should also be aware of elusive exogenous variables such as the many salient macroeconomic disturbances, be it

economic recessions, the Gulf War, and other changes in the local economy of the cities concerned.

The second limitation pertains to the differential reporting of traffic for commuter and non-commuter carriers, which in-turn resulted in *O&DPLUS* giving 100% sample traffic figures for a specified number of commuter carriers, but the usual 10% sample for the non-commuter carriers. In order not to mix the two sets of data, especially for markets which have a mixture of both commuter and non-commuter services, the following study will focus only on markets that are served entirely by jet flights provided by non-commuter carriers.

Then, in order to keep the study of competition simple, the markets selected should not, if possible, be ones that are severely cluttered with a large number of competitors. While a market consisting of one incumbent and one challenger would seem ideal for study because of its simplicity, it may be revealing to examine markets where competition is intense. On the other hand, even though the number of competitors may be large, one may usually eliminate the minor players with the application of a reasonable minimum market-share criteria whereby any carrier that has consistently secured less than 5% of the total origin-destination traffic of the market should not be considered a significant player.

Although the data used for both *O&DPLUS* and *ONBOARD* share the same source (DOT Form 41 reports), the exact correspondence is questionable in that *ONBOARD* provides information only for nonstop services whereas *O&DPLUS* does not segregate the traffic so finely. For example, *O&DPLUS'* traffic data between two specified cites includes all passengers who flew on nonstop, multi-stop, and connecting flights to reach their final destination. An indicator of routings of the origin-destination passengers (nonstop, multistop, connecting) is the "Average Coupons" reported in *O&DPLUS*, whereby a number of 1.00 indicates that all passenger flew on nonstop or direct flights (requiring only one ticket coupon), while any number larger than 1.00 indicates that a certain proportion of the passengers flew on connecting services (requiring at least two ticket coupons). Since one cannot isolate the true nonstop origin-destination passenger from the given data, one may circumvent the problem by selecting markets which are served exclusively by nonstop flights. In reality, except for the very short-haul markets with a flight-time of less than 1.5 hours or so, many markets would not satisfy this condition. As such, the author systematically relaxed the criteria by choosing markets for which at least 90% of the flights are nonstop services; roughly speaking, if only one line out of every 10-15 lines in the Official Airline Guides' schedule listing is a multistop flight, then the 90% criteria is satisfied.

In summary, the selection criteria for airport-pairs includes:

- The market should consist almost exclusively of nonstop services (90%), and that the "Average Coupon" reading should not exceed 1.10;
- The market is not served by commuter carriers, and
- Only airlines which consistently secure more than a 5% share of the total origin-destination market in each quarter are of interest.

With the selection criteria in mind, four airport-pairs were chosen for each of the first three scenarios and two for the last scenario, as summarized in Table 5.41 below.

Table 5.41 The 16 Airport-Pairs Selected For The Study.

Scenario	Chicago Markets	Houston Markets
Scenario 1: MAS<->Non-Hub Destination	Chicago-Des Moines Chicago-Omaha	Houston-New Orleans Houston-San Antonio
Scenario 2: MAS<->Hub Of Challenger	Chicago-Atlanta Chicago-Pittsburgh	Houston-Memphis Houston-St. Louis
Scenario 3: MAS<->Hub Of Incumbent	Chicago-Denver Chicago-Nashville	Houston-Denver Houston-Newark
Scenario 4: MAS<->MAS	Chicago-Detroit	Houston-Dallas

5.5 Method Of Analysis

The analysis essentially consists of anecdotal descriptions of the competitive behavior of airlines in the fourteen airport-pairs selected. The hypothesis is that the competitive dynamics, as reflected in changes in the quarterly average fare, the frequency profile, the load factor, and the total origin-destination traffic between a given airport-pair, determine, to a large extent, the market share shift characteristics for both the airlines' and the airports' total origin-destination traffic, thereby providing some evidence of the viability of air service between specific airport-pairs within a given market. Additionally, the number of non-origin-destination passengers, when jointly assessed with the load factor, is also an important element to consider since one may postulate that non-origin-destination traffic does, in part, provide economic justification for the service, especially for markets where the origin-destination traffic volume is relatively small. In short, one hopes to find some supporting evidence that service into

several airports within a large urban area is perhaps perpetuated by the presence of competition between the airlines as opposed to accessibility concerns alone. Contrary to previous research efforts, the author suspects that airport choice is brought about by the quality of airline service, with passengers responding accordingly to the competitive 'offers' airlines present to potential air travelers.

Before plunging into the analysis, it may be worth mentioning that as early as 1972, William Fruhan Jr. [48] of the Graduate School of Business Administration at Harvard University suggested a methodology of analysis of the competitive behavior of airlines. In particular, Fruhan advocated the use of marginal analysis, whereby variables such as seats, share of seats, market share, passengers flown, passenger load factor, and overall load factor in the "later competitive position" are compared with those in the "initial competitive position". Acknowledging the S-shaped curve relating market share and frequency share, Fruhan put forth the idea that airlines, during the regulated era, had two basic strategies for success: to maintain the route's overall load factor, or to maintain market share at any cost.

Based on the economic presumption that capacity share will be translated into market share, which in turn translates into profit share, Fruhan believed that there was a strong propensity for airlines to compete along the dimension of capacity. However, he cautioned that there was a limit to the game since airlines would eventually realize that it was "no longer economic" [48] to play the game. By means of a similar marginal analysis, Fruhan further demonstrated the value of a one-point increase in market share now versus later, thereby prescribing that market share duels should occur during the "robust stages" of market growth in the industry. As the industry matures and growth slows, Fruhan expected the intensity of the battle to subside. One interesting point mentioned by Fruhan is the significance of the advantage an airline can have because of the aircraft chosen. In other words, Fruhan believed that the airline which orders a new type of aircraft first will usually secure earlier delivery positions, and that, should the aircraft prove to be superior in performance and consumer preference, the airline ultimately gains an edge over its competitors. Perhaps as this aspect of competition is less quantifiable, equipment advantage will not be specifically addressed in this thesis.

While Fruhan had tried to show if airlines were maintaining market shares or load factors over time, the rest of the chapter presents a detailed case-by-case description of the competitive behavior of airlines in multiple airport systems by emphasizing the effects of changes in the competitive variables on the traffic size for both the challengers and the incumbents in a given market, and how the competitive dynamics sustain or remove service in an airport-pair within a given market. More

specifically, the discussion for each case will be in-line with the notion that passengers are the customers of airlines, and airlines are, in-turn the customers of airports, a notion that is embodied in the pictorial equation presented in Chapter 1 of this thesis.

To elucidate the competitive dynamics graphically, the following plots were generated for each of the 14 selected airport-pairs:

- Quarterly average one-way fare,
- Average number of nonstop departures per day each way,
- Smoothed quarterly origin-destination traffic,
- Smoothed quarterly non-origin-destination traffic,
- Average quarterly load factor, and
- Smoothed quarterly total airport-to-airport origin-destination traffic.

Given that most airlines have revenue management systems and generally match fares in order to be competitive, the average fare for a given quarter for an airline, as given by *O&DPLUS*, is a sufficient indicator of the level of fare competition in the market. The specific value of the fare is not too critical; one should focus on the trends, particularly when an challenger enters the market. The average fares during the quarter of entry and exit of an airline may be unusually high or low because the average fare calculated may be distorted by the smaller number of tickets sold during such quarters.

ONBOARD provided the total number of nonstop flights in both directions for the entire quarter. However, to calculate the number of nonstop flights per day in each direction with reasonable accuracy, certain assumptions were made. Although each quarter, as defined by *ONBOARD*, corresponds to the respective three months of the calendar year, and that certain quarters have a few more days than others, the author has decided, for consistency and simplicity's sake, to assume that each quarter consists of 90 days. Further, assuming a perfect symmetry of flights in either direction, the number of flights per day in each direction is then given by:

$$\frac{\text{Quarterly Total Number Of Departures In Both Directions}}{(90 \times 2)}$$

The reader should bear in mind that figures for the first and last quarter of operations can be misleading because the airline may not have initiated a service on the first day of that quarter, and ended the service on the last day of the quarter. Consequently,

attention should be given to the first full quarter of operations and the last full quarter of operations instead of the first and last data point on the graph.

To remove the highly cyclical nature of the traffic, the given quarterly origin-destination and non-origin-destination data were first smoothed using a simple conventional 4-quarter moving average technique [49] where:

$$X_T = 0.25[x_t + x_{t-1} + x_{t-2} + x_{t-3}]$$

for T=1,2,...n-3, and t=4,5,6...n. However, in order to include the first three data points so that the resulting curve does not have a four-quarter lag, the moving average method will be slightly modified; that is, three 'artificial' data points, each of which has the same value as the first data point of the original data set, will be added to the original data. This should ensure that the smoothed data will always begin with the first data point of the original set. By using smoothed data that does not suffer from a time-lag of four quarters, one would then not encounter complications when analyzing the traffic data in tandem with the non-smoothed average fares, frequency, and load factors. Unfortunately, the data is not always perfect; cases of missing data for one or two quarters as well as those where the origin-destination traffic exceeds the total number of onboard passengers are the more startling faults. In the latter case, the number of non-origin-destination passengers is not calculated at all. Further, care was taken when interpreting data for the first quarter and last quarter of operations as the airline may not have had a full quarter of operations during such quarters.

All in all, the methodology is fairly straightforward but the analysis and interpretation of the data can be a genuine challenge due to the multi-dimensional nature of competition, not all of which may be explained by what has been quantified. However, the author will still attempt to use the collected data to find some support for showing the link between passengers' choice, competitive behavior of the airlines, and the distribution of passenger traffic at the multiple airport systems of interest.

CHAPTER 6

DATA ANALYSIS AND INTERPRETATION

The following chapter presents the anecdotal analysis of the 14 selected cases mentioned in Table 5.41 in the previous chapter. The discussion will primarily focus on the way passengers and airlines react to new services offered by challengers in a given market and how this in-turn affects the distribution of origin-destination (OD) traffic amongst the airport pairs examined. Passengers respond to fares and frequency of service offered by challengers and incumbents, while airlines may respond to challengers by altering frequency or fares. Also, one may examine the mix of OD and non-OD passengers as well as the average load factors as a means of assessing the viability of a service initiated by challengers. The six supporting graphs for each of the 14 cases, all of which are included at the end of the analysis of each case, appear in the following order:

- Smoothed Quarterly OD Traffic
- Average One-Way Fare ($)
- Average Number Of Nonstop Departures Per Day Each Way
- Smoothed Quarterly Non-OD Traffic
- Average Quarterly Load Factor (%), and lastly,
- Smoothed Quarterly Total Airport-To-Airport OD Traffic.

6.11 Scenario 1: Chicago-Des Moines (MDW/ORD-DSM, Distance = 312 miles)

Preliminary Remarks

An immediate observation is that the Chicago-Des Moines market is not characterized by significant growth over the 10 years (Figure 6.111). Competition was not very fierce since each of the three participants seemed quite content with its own market share, as the three separate horizontal lines in Figure 6.111 indicate. Nevertheless, the most unusual observation is that Midway Airlines, by initiating services from MDW to DSM, had apparently stimulated OD traffic between the two cities while United and American, carrying a preponderance of non-OD traffic, were virtually unaffected by Midway's entry.

Passengers' Response To Challengers

American was the first airline to challenge United at O'Hare. Both airlines have established hubs at ORD, and passengers responded very favorably to American's entry in the third quarter of 1984 since American seemed to have immediately captured its own sizable share of OD passengers by offering about half the number of flights as United. Accessibility was not an issue since both challenger and incumbent operated to and from the same airport. However, due to its lower load factors, which created a greater availability of lower average fares, American consistently captured about half the number of passengers while offering three flights per day compared to United's five (Figure 6.113). One can conjecture that the passengers were responding to the availability of lower fares since the entry of American did bring about an immediate increase of about 20% in total OD traffic between the two cities. However, the OD traffic level then stabilized over the next 10 quarters.

When Midway Airlines, the second challenger in the Chicago-Des Moines market inaugurated services from MDW, another new group of passengers seemed to have appeared because there is, once again, an immediate increase in the total OD traffic in the MDW-DSM market (Figure 6.111). In fact, by offering a frequency that is comparable to American's, and a fare which was initially the lowest of the three carriers (Figure 6.112), Midway, operating out of Chicago's most accessible airport, captured slightly more OD traffic than American at ORD. However, over the succeeding years, when service at MDW was available, passengers overwhelmingly preferred ORD even though fares were similar, perhaps because of the wider choice of departure times. With Midway's exit in the fourth quarter of 1991, the once faithful air travelers at Midway seemed to have disappeared. In fact, only American recorded a slight increase in OD

traffic between the second quarter of 1991 and second quarter of 1992. However, with Midway offering low introductory fares in the first quarter of 1987, average fares of United and American in the ORD-DSM market plummeted from a high of about $150 in the first quarter of 1987 to a low of about $100 by the second quarter of 1988 as both American and United matched Midway's low fares. Midway did not maintain its low introductory fare of $70 throughout the years; instead, Midway's average fares gradually climbed to about $175 by the fourth quarter of 1990, with American and United's average fares moving in tandem with Midway's. The higher average fares did not seem to elicit an adverse response from the OD passengers in either the ORD-DSM or MDW-DSM markets since sharp decreases in traffic were not observed.

Airlines' Response To Challengers

United and American, though direct competitors at ORD, made rather independent decisions on frequency as can be seen by the consistent frequency gap over the 10 years. In the first quarter of 1985, United may have offered fewer flights than American, but the circumstances leading to such an apparent anomaly were not clear. However, the sudden withdrawal of flights did not adversely affect United's share of OD traffic since only a slight decrease in OD traffic was recorded for that particular quarter. A look at the load factor data revealed that United, despite offering the most flights, struck a good balance between supply and demand because it secured the highest load factors which typically exceeded 50% (Figure 6.115). These figures are attributed to United's carriage of a large number of non-OD traffic - about three times that of the OD traffic (Figure 6.114) - which it could well-accomplish by nature of its extensive network emanating from ORD.

American, with fewer flights than United, did secure a significant share of non-OD traffic as well - about four times the magnitude of its OD traffic - but load factors were much lower, hovering around 30% in most quarters. Midway, despite its smaller network, was also able to capture a large number of non-OD traffic. Load factors were intermediate between that of United's and American's, averaging about 40%. However, the most interesting observation is that shortly after Midway's exit, United achieved growth in the non-OD traffic while American had already started achieving gains three quarters before Midway's exit.

Concluding Remarks

A glance at the airport-to-airport total OD traffic curves in Figure 6.116 indicates very clearly that each challenger brought additional traffic into the market. Airport competition was present since there was a slight decrease in OD traffic in the larger ORD-DSM market when services between MDW and DSM were available. While stimulation of OD traffic was observed, one may conclude that the majority of passengers still selected an airport on the basis of frequency; OD traffic in the ORD-DSM market exceeded that of MDW-DSM by about three times because there were clearly more flights at ORD than at MDW. Average fares were brought down because of Midway's entry, but the low fares were not permanent. In fact, compared to that in 1984, average fares had increased by about $50 by 1993. Thus, the passengers may only have reaped benefits for about a year (between 1987 and 1988) - the year immediately after Midway's entry. However, given that the two cities are only 312 miles apart, passengers did not discontinue traveling by air even though fares had increased. Indeed, new services created new opportunities and options for those considering travel between the two cities of Chicago and Des Moines.

Figure 6.111 Chicago-Des Moines: Smoothed Quarterly OD Traffic

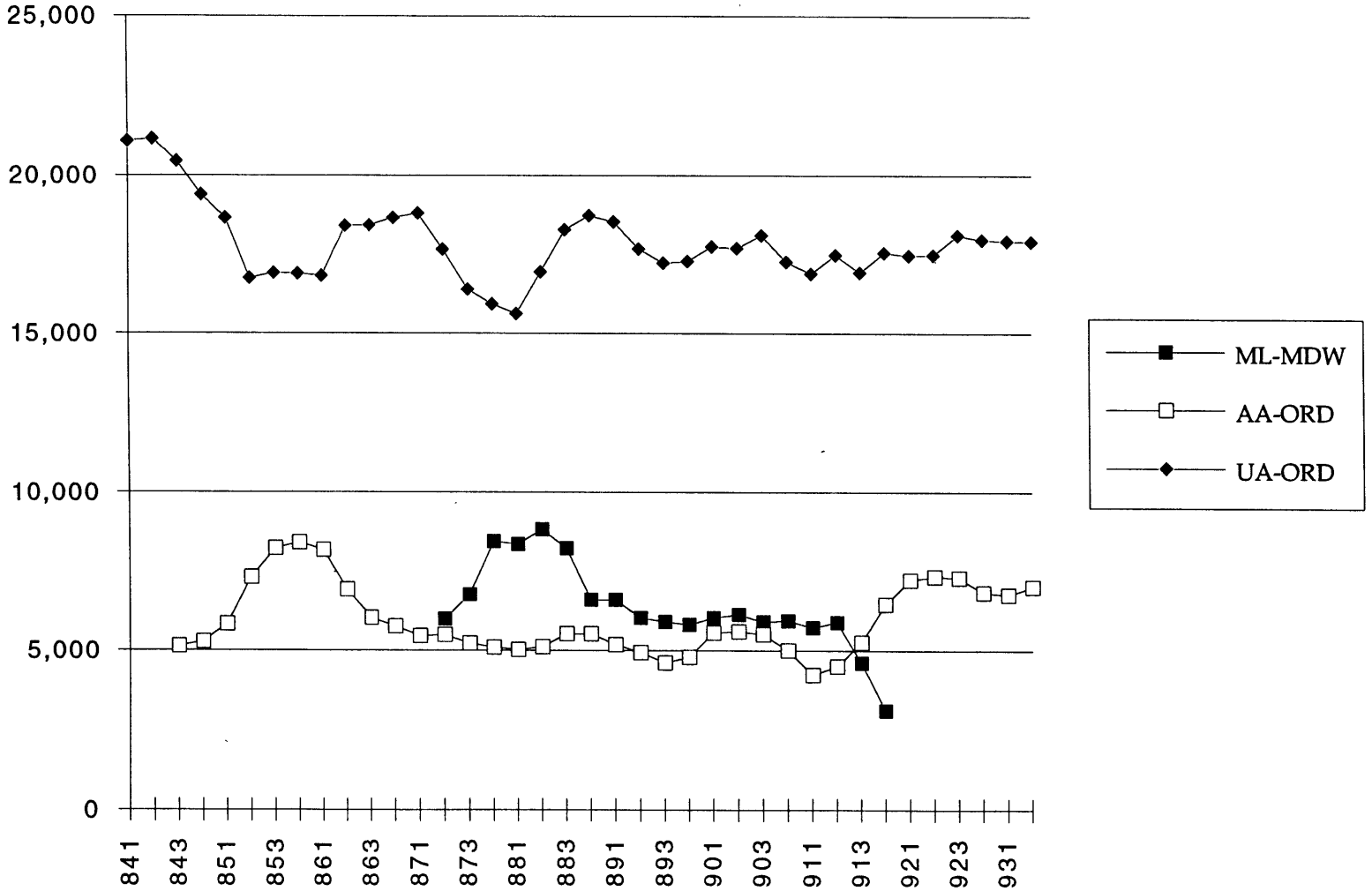


Figure 6.112 Chicago-Des Moines: Average One-Way Fare ($)

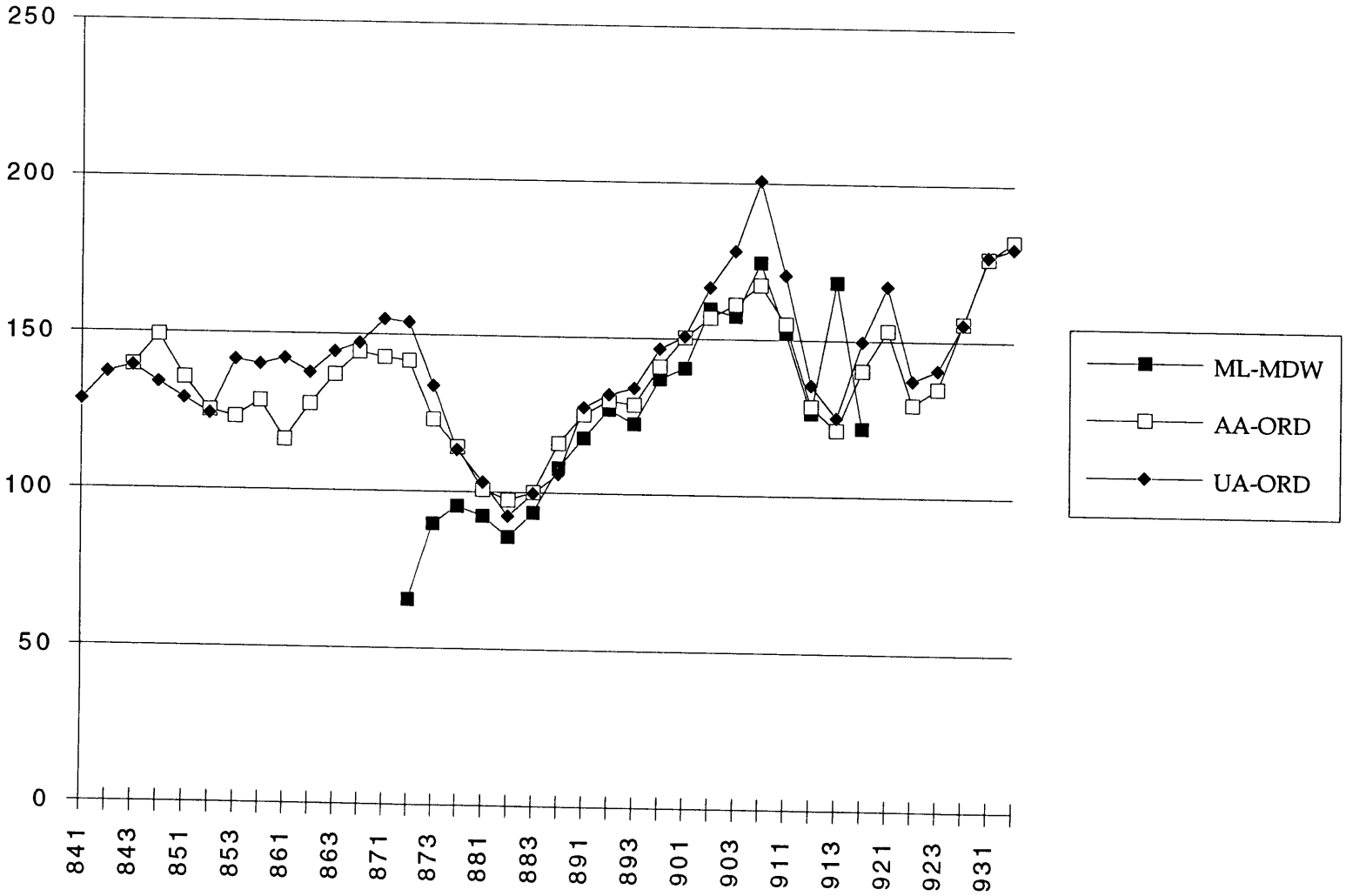


Figure 6.113 Chicago-Des Moines: Average Number Of Departures Per Day Each Way

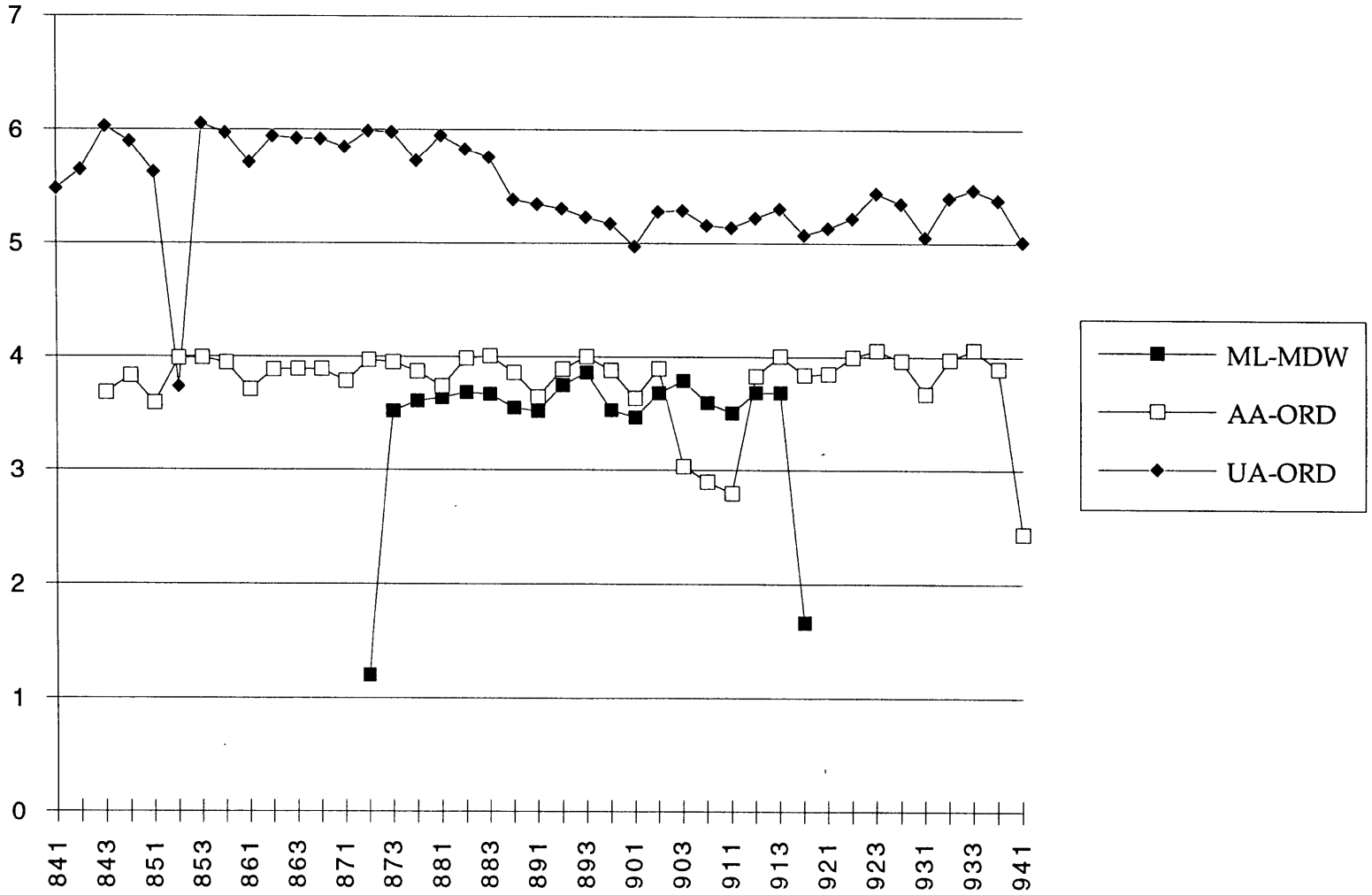


Figure 6.114 Chicago-Des Moines: Smoothed Quarterly Non-OD Traffic

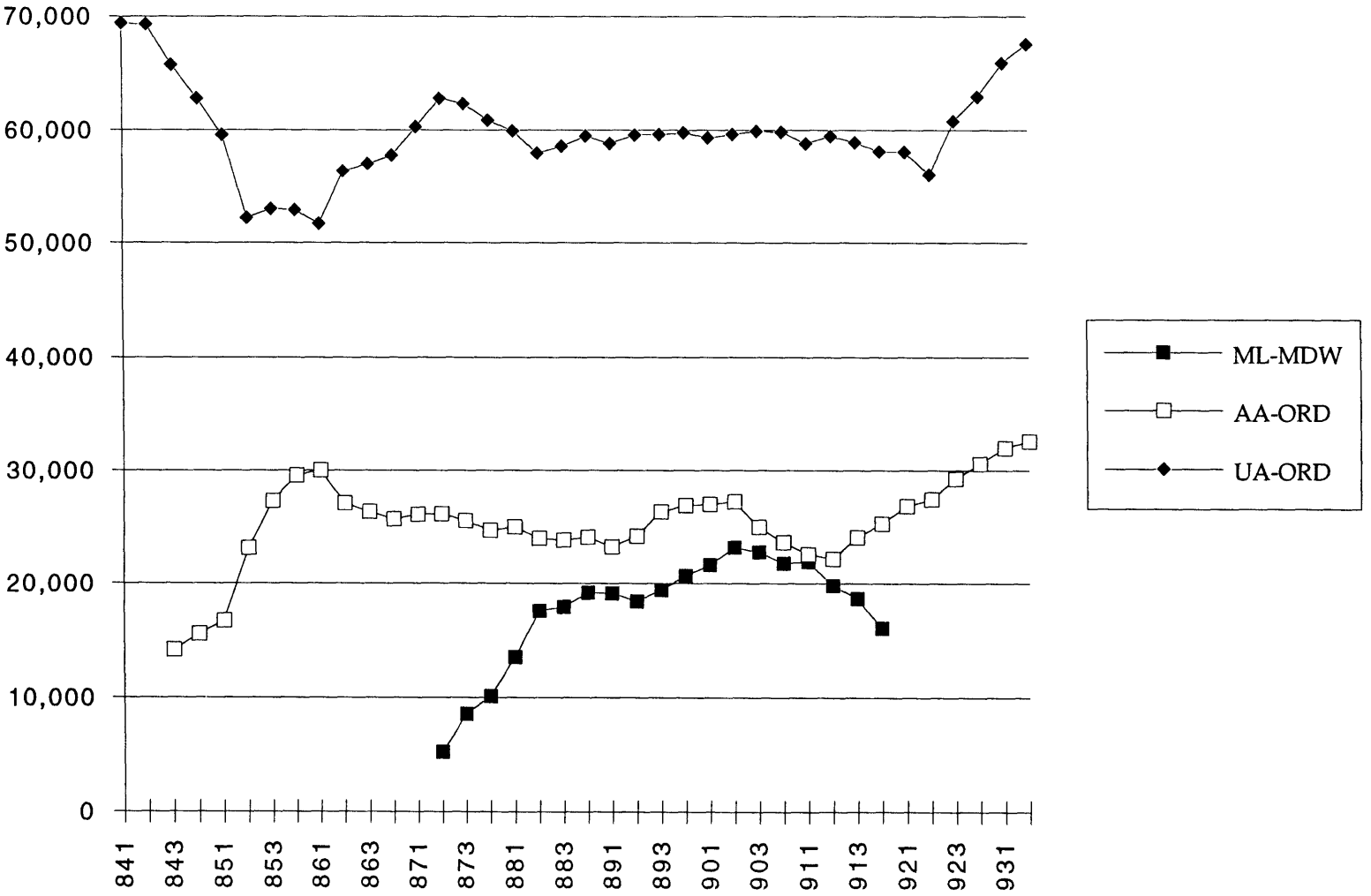


Figure 6.115 Chicago-Des Moines: Average Quarterly Load Factor (%)

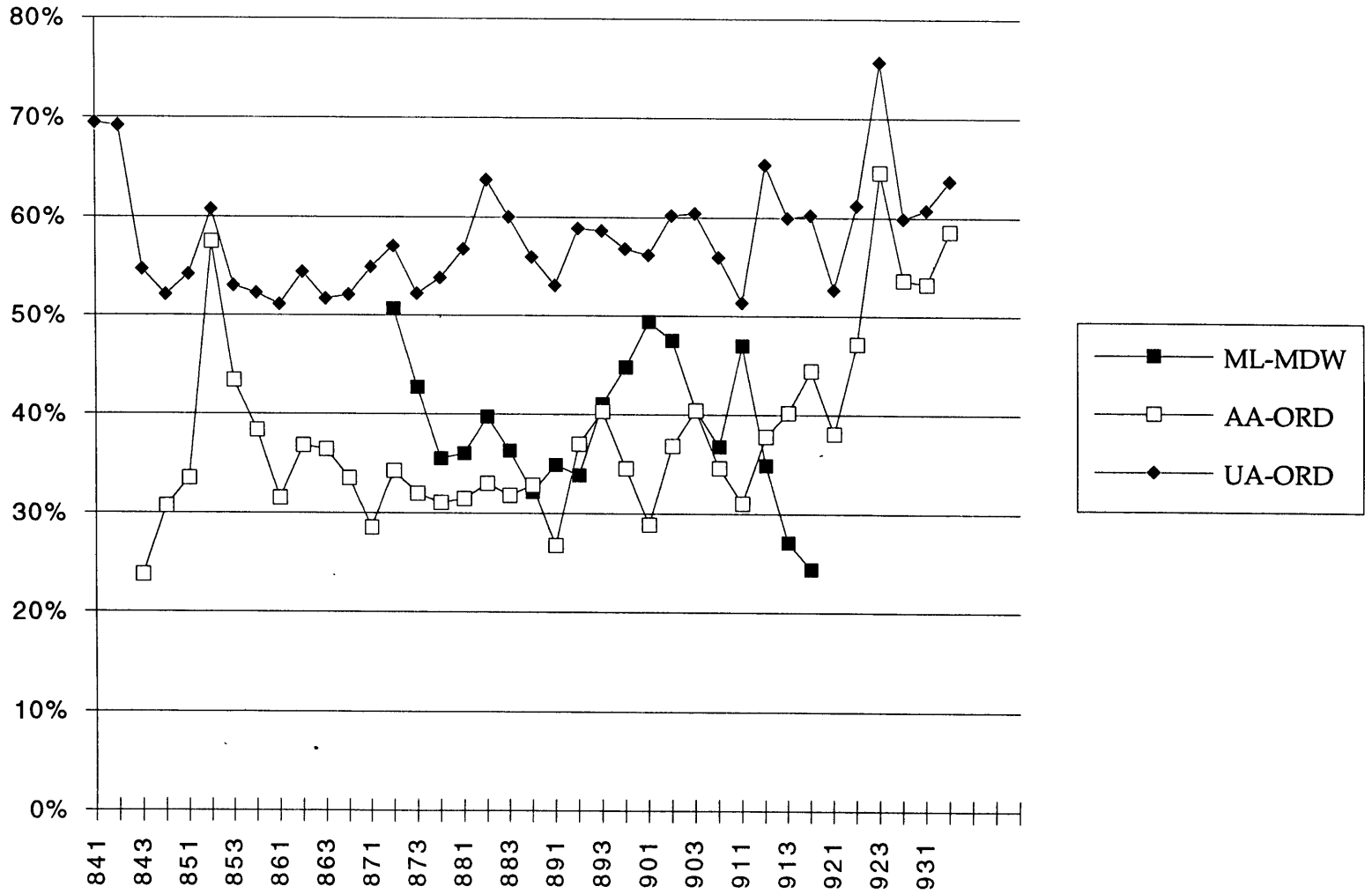
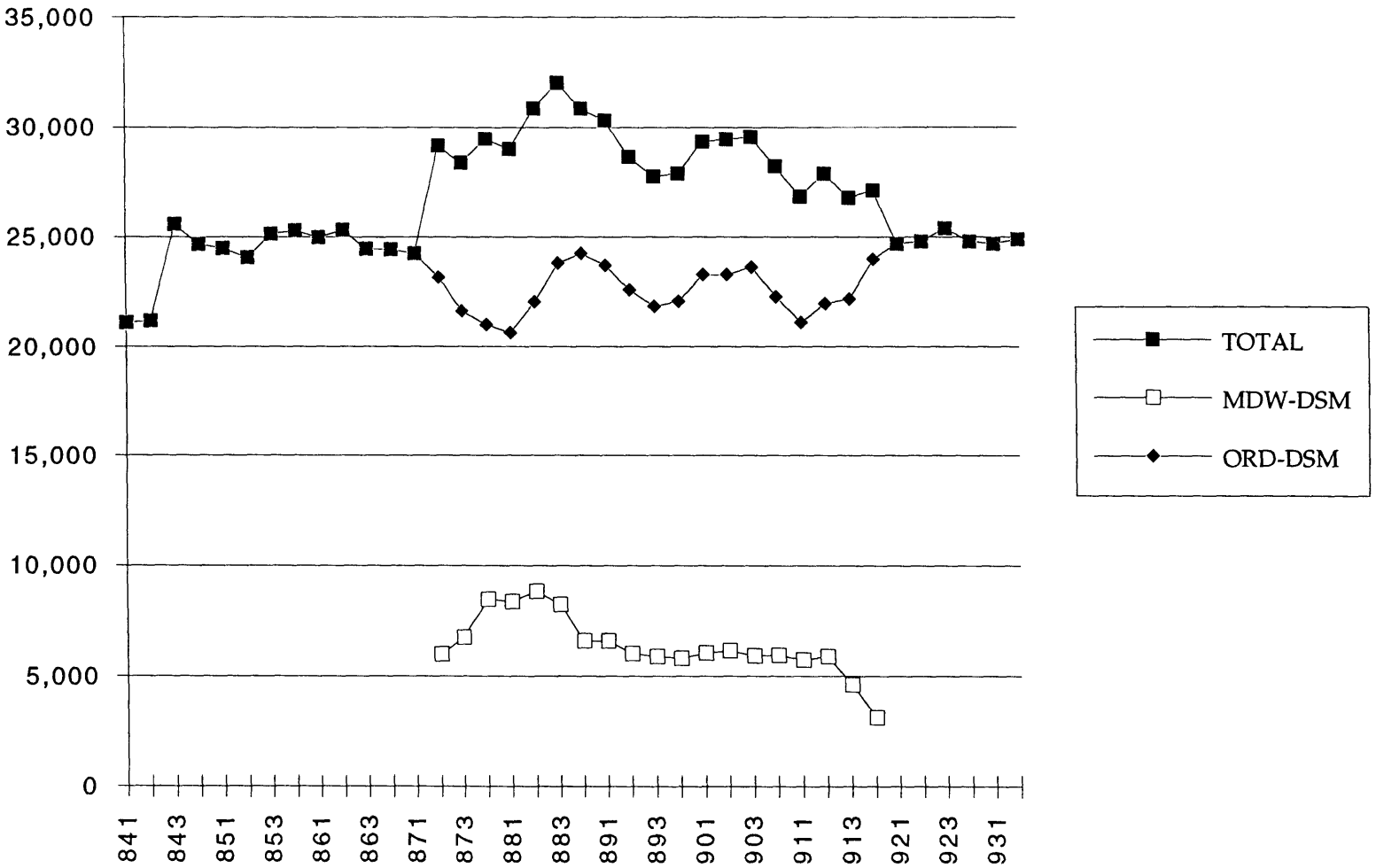


Figure 6.116 Chicago-Des Moines: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.12 Scenario 1: Chicago-Omaha (MDW/ORD-OMA, Distance = 430 miles)

Preliminary Remarks

By examining the OD traffic curves in Figure 6.121, one can say that, much like the Chicago-Des Moines market analyzed earlier, the Chicago-Omaha market is not characterized by very intense rivalry between the airlines since each airline seemed content with its own share of OD traffic. Nevertheless, unlike the previous case, Midway Airlines secured a significantly larger number of OD passengers than American for the first six quarters following the introduction of its services in the MDW-OMA market, thereby indicating that its entry in the new MDW-OMA market was quite successful.

Passengers' Response To Challengers

The entry of the first challenger, American Airlines, at ORD in the third quarter of 1984 seemed to have stimulated travel between the two cities because American immediately captured about 5,000 passengers in the quarter it entered the ORD-OMA market (Figure 6.121). In other words, air travelers, even though aware of United's existing service between OMA and the same airport of ORD, responded to the new service. Despite offering fewer flights per day than United, American's service was attractive to air travelers perhaps because it offered slightly different departure times. However, some carrier-switching may have occurred shortly after American's entry because United saw a gentle decline in OD traffic in the two quarters after American's entry. Then, in 1985 alone, American may have recorded a slight increase in OD traffic as passengers responded to its offer of lower fares.

However, stimulation of OD traffic was observed once again when Midway Airlines introduced a new service between the more accessible Midway Airport and Omaha. Indeed, Figure 6.121 shows that some passengers continued to fly United and American, while a new group of air travelers gave staunch support to Midway, particularly between the first quarter of 1987 and the fourth quarter of 1987, when Midway captured a larger number of OD passengers than American for roughly the same frequency. A closer examination of the OD traffic curves in Figure 6.121 does indicate that American was not affected by Midway's entry, but United was affected since it experienced a slight decline in OD traffic during Midway's first year of operations. One could also infer that passengers were keen on flying Midway because of the lure of the low introductory fare of about $70 as compared to the $130 fare offered by its rivals at ORD in the first quarter of 1987 (Figure 6.122). Although Midway raised

its fares in the quarters after its entry while American and United lowered their fares in an attempt to match Midway's low fares, all three airlines only achieved a similar average fare in the first quarter of 1988, exactly one year after Midway's entry. With fare-matching in place, Midway reduced the number of departures because it began losing OD passengers very rapidly over the four quarters of 1988, while United, on the other hand, saw a corresponding increase in OD traffic in the same year.

Between the second quarter of 1989 and the second quarter of 1990, when Midway offered fewer flights per day at MDW than American at ORD, passengers seemed to have shown only a marginally higher preference for the flights into and out of MDW despite the lower fares that Midway offered. Indeed, Midway's OD traffic had noticeably halved just two years after it inaugurated service in the new market of MDW-OMA; this loss was permanent even though it tried to boost frequency in the third quarter of 1990 and maintain the lower fare. Amidst all these changes in the MDW-OMA market, passengers in the ORD-OMA market were apparently oblivious to what was happening at MDW since the OD traffic level for United and American remained fairly stable in the quarters after the fourth quarter of 1988 and after Midway's exit in the fourth quarter of 1991. In fact, one may conclude that the 'fans' of Midway disappeared together with the exit of Midway because these passengers did not choose to fly United or American in the quarters after Midway's exit since sudden jumps in OD traffic were not observed for United and American.

Airlines' Response To Challengers

A glance at the frequency curves in Figure 6.123 indicate that American and Midway, the two challengers, were not attempting to match United's frequency. However, with United's six flights per day in each direction and its extensive network emanating from its hub at ORD, it was well able to secure a sizable number of non-OD passengers that was typically three times the number of OD passengers. United was then able to boast of its relatively high load factors that usually exceeded 50%. American, the close rival of United at ORD, faired worse in capacity-demand management because with its three or four flights a day in each direction and its hub operations at ORD, it captured four times more non-OD traffic than OD traffic, but had to contend with ailing load factors that ranged between the upper 20s and 40s. By eliminating one flight a day in each direction in the third quarter of 1990, American subsequently, achieved a slight improvement in its load factors.

Midway's operations between MDW and OMA were unusual in that for the first four quarters, it attracted more OD than non-OD passengers. This may be explained by

the fact that it had not fully developed its extensive hub-and-spoke network at MDW until the late 80s. By 1989, non-OD traffic had exceeded OD traffic by a factor of two, resulting in load factors that were intermediate between that of United and American (around 40% most of the time). However, Midway seemed content with just matching American, if it could, for its services between MDW and OMA. Fare matching was prevalent, with Midway, typically offering the lowest fares. Indeed, it was Midway which brought the average fares of all three carriers to a low of just over $80 in the second quarter of 1988. The low average fare was short lived since Midway raised its fares until the original average fare of about $140 was attained by the fourth quarter of 1990, by which time United's average fare had risen to a maximum of close to $190. In spite of the higher fares toward the late 80s, OD traffic between the two cities did not decline, thereby indicating that demand for air services between Chicago and Omaha is perhaps inelastic.

Concluding Remarks

In summary, one may say that the Chicago-Omaha market was clearly stimulated by both challengers, one at ORD, and the other, at MDW. A closer look at Figure 6.121 does reveal that Midway was more successful in stimulating traffic by offering services at the more accessible airport, as seen by the sudden jump in total OD traffic in the first quarter of 1987. Perhaps such an observation is encouraging in that it lends support to the notion that attractive air services at the more accessible secondary airport can be viable. Like the Chicago-Des Moines market, air travelers did not really benefit from Midway's low introductory fares for too long, but since total OD traffic merely declined by about 5,000 per quarter during the period of the hike in average fares, one may conclude that the demand for air travel between these two cities, separated by a distance of 430 miles, is relatively inelastic.

Figure 6.121 Chicago-Omaha: Smoothed Quarterly OD Traffic

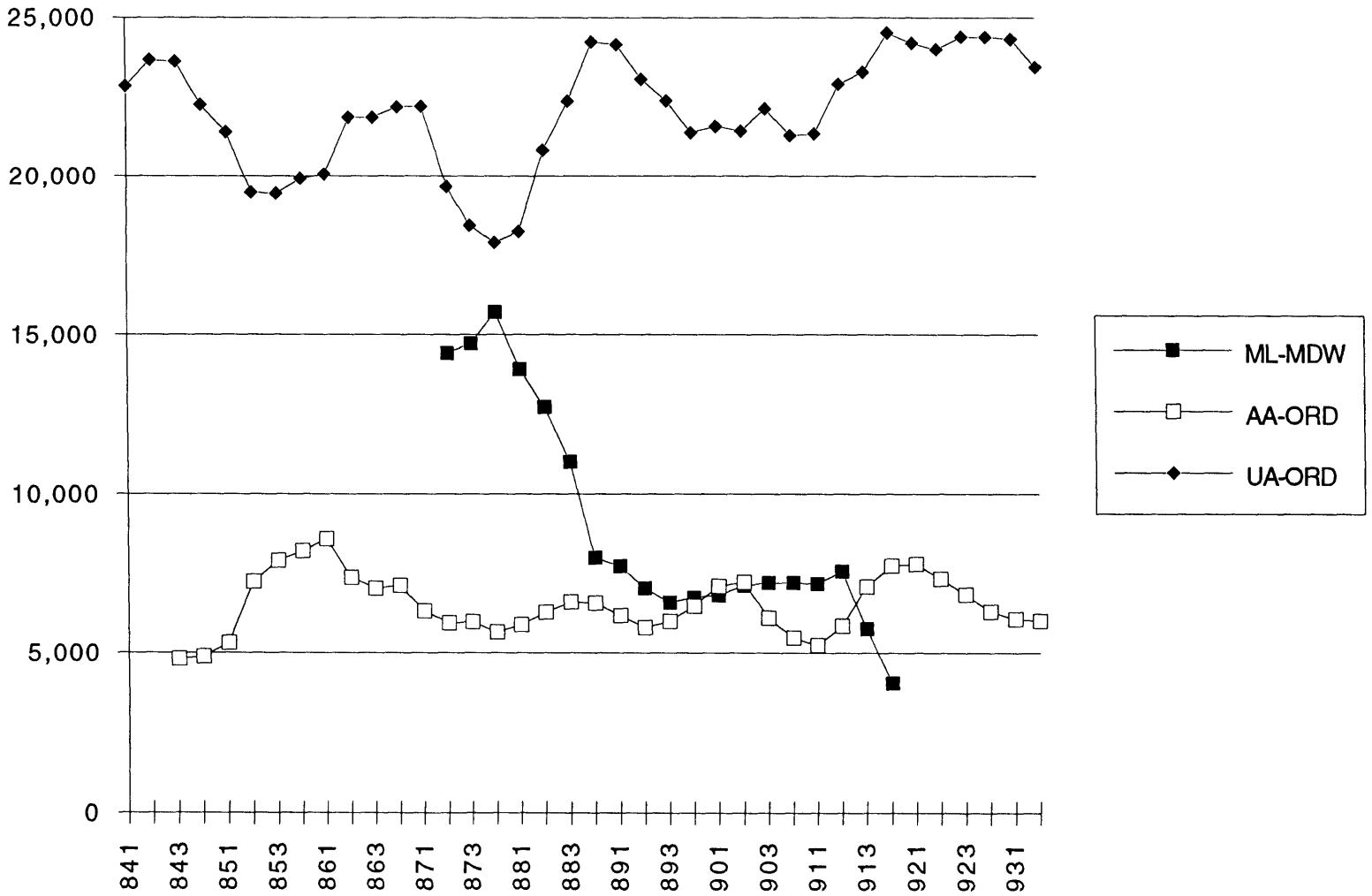


Figure 6.122 Chicago-Omaha: Average One-Way Fare ($)

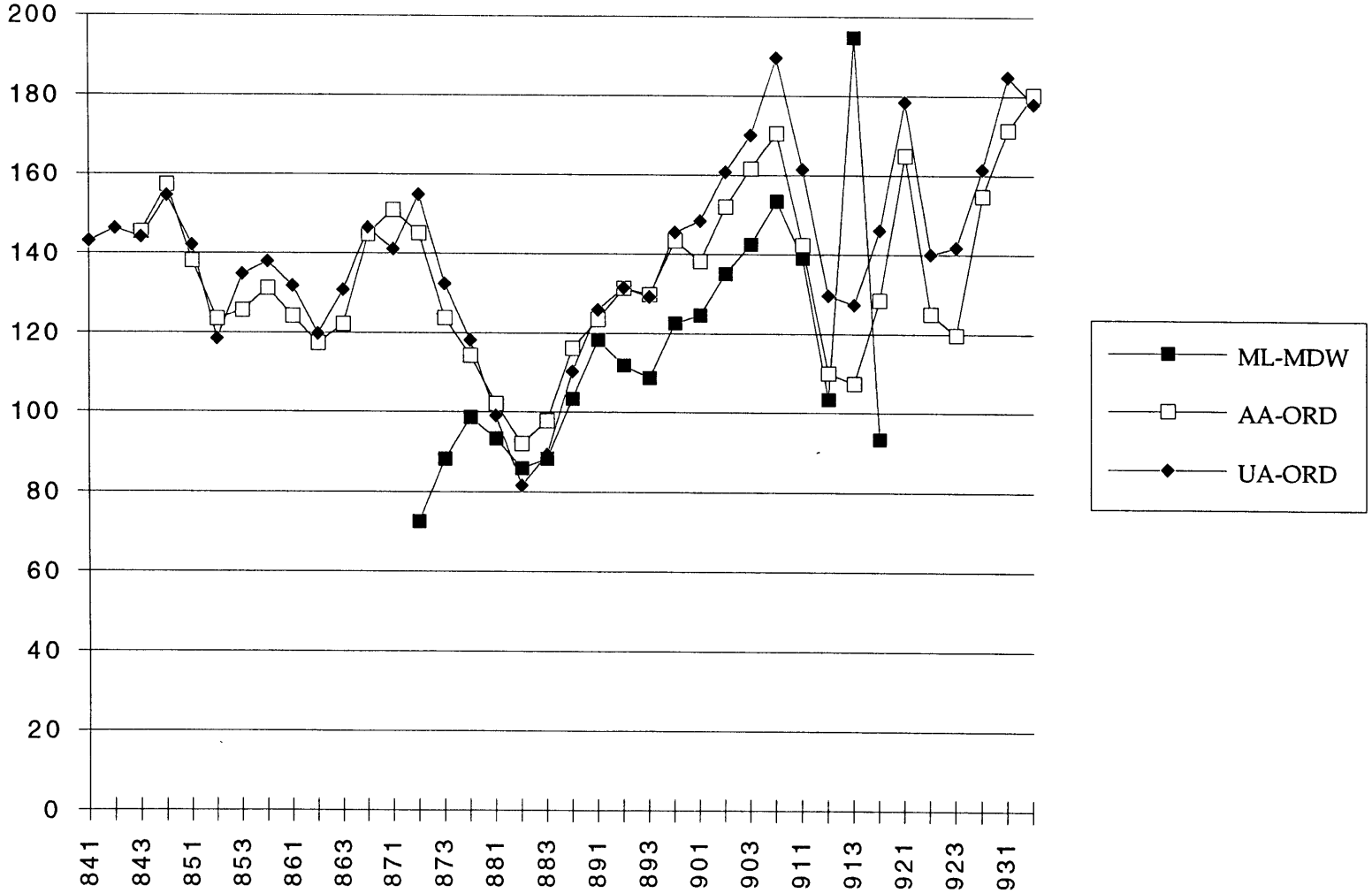


Figure 6.123 Chicago-Omaha: Average Number Of Departures Per Day Each Way

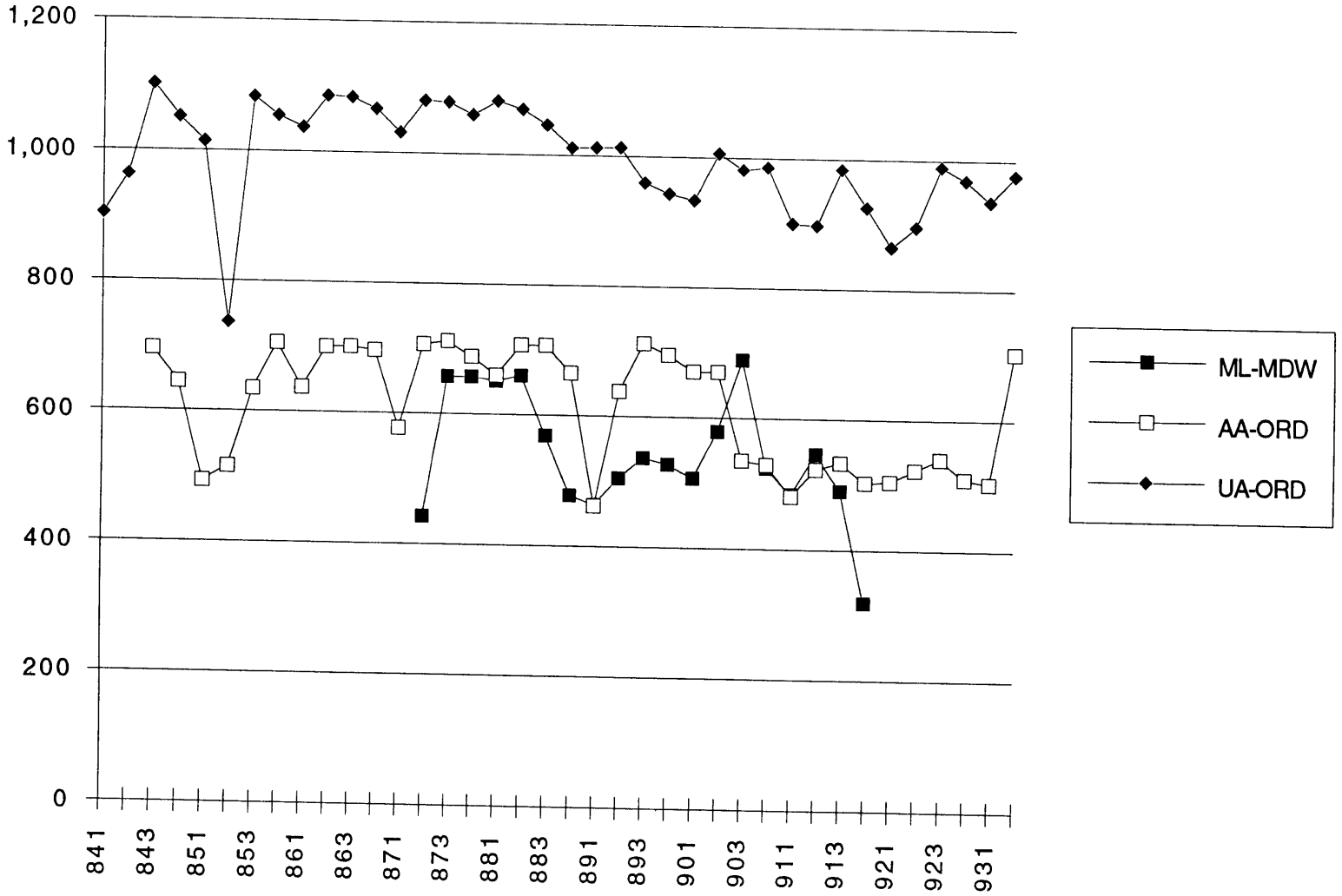


Figure 6.124 Chicago-Omaha: Smoothed Quarterly Non-OD Traffic

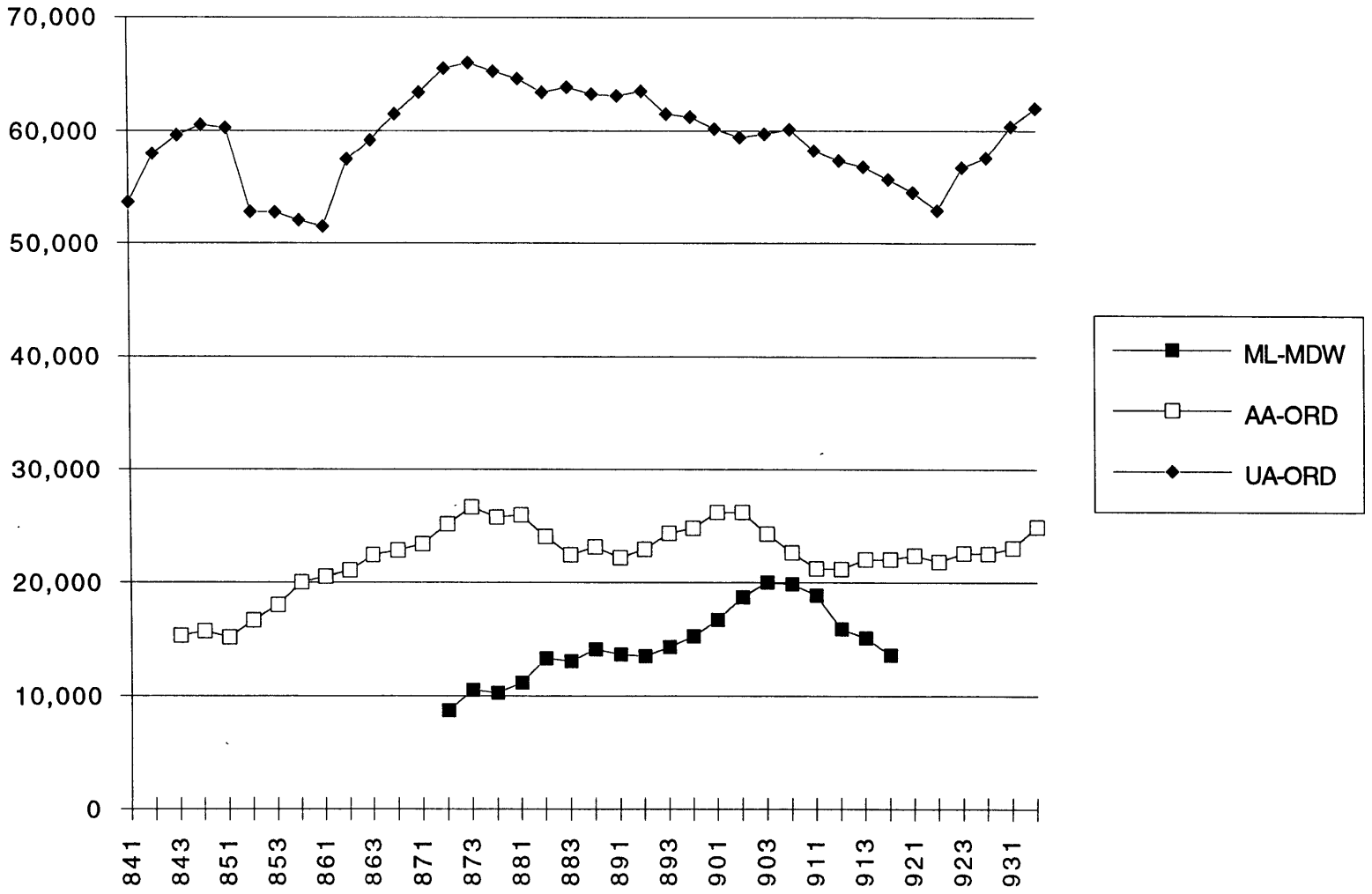


Figure 6.125 Chicago-Omaha: Average Quarterly Load Factor (%)

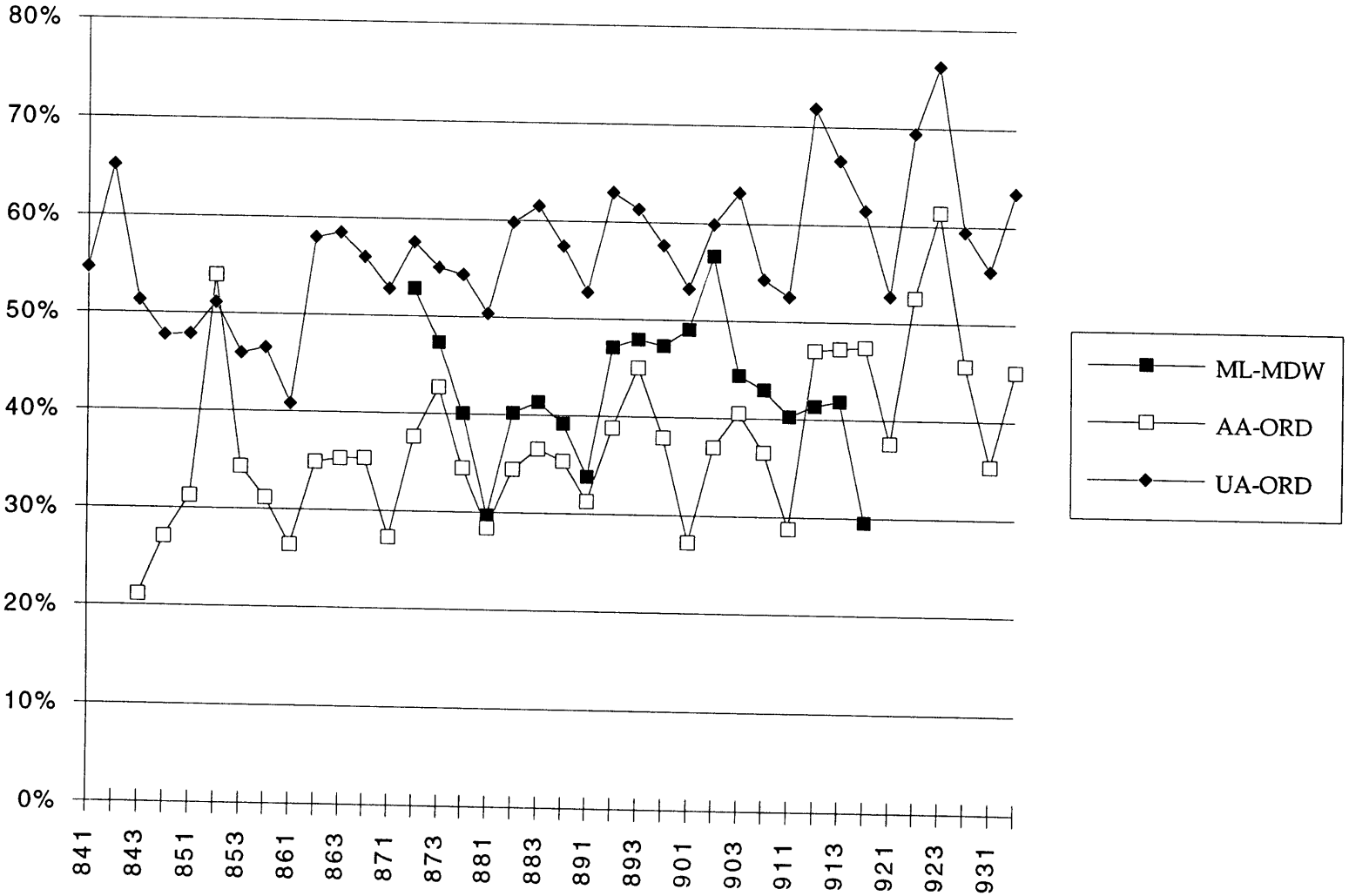
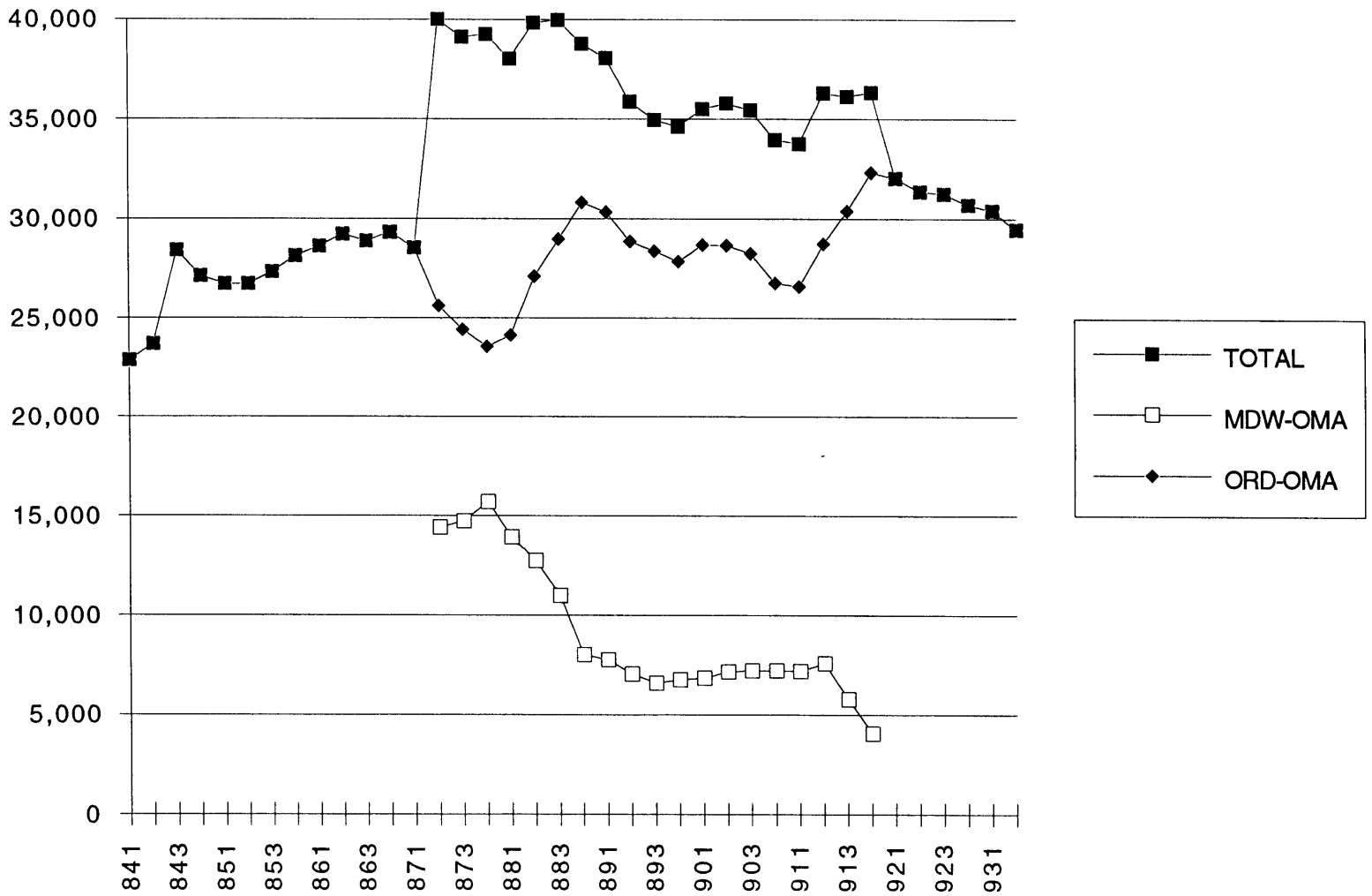


Figure 6.126 Chicago-Omaha: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.13 Scenario 1: Houston-New Orleans (HOU/IAH-MSY, Distance = 315 miles)

Preliminary Remarks

A quick glance at the graph of the total OD traffic between Houston and New Orleans (Figure 6.136) indicates that the Houston-New Orleans market may not be classified as a high growth market because an overall increase in OD traffic was not observed over the period between 1984 and 1993. However, after the exit of Eastern and Delta, Continental initiated a challenge with its service between HOU and MSY, in direct competition with its own parallel service between IAH and MSY. Also of interest in this market is the unusual V-shaped curve in Figure 6.131, which demonstrates how Southwest lost and regained its OD traffic share within a short time.

Passengers' Response To Challengers

Prior to the first quarter of 1987, the quarter when Continental initiated a challenge, Southwest was the clear leader in terms of OD traffic (Figure 6.131). Indeed, with its unrivaled 13 flights per day in each direction, most air travelers in the Houston-New Orleans market probably chose to fly Southwest because of the better choice of departure times and the more convenient access of Hobby Airport to downtown Houston, even though Southwest's fares were not necessarily the lowest (Figure 6.132). However, Southwest's rapid reduction of frequency of service from 13 to seven flights per day each way between the second quarter of 1985 and the first quarter of 1986 resulted in air travelers turning away from Southwest, which perhaps explains the left branch of the 'V' in Figure 6.131. Indeed, by boosting its frequency of service from four flights per day in each direction in the second quarter of 1985 to 10 flights per day in each direction by the third quarter of 1986, Muse Air achieved a sharp increase in OD traffic despite its offer of fares that were higher than Southwest's. In fact, between the third quarter of 1986 and Muse Air's last quarter of operations in the third quarter of 1987, Muse Air captured more passengers in the Houston-New Orleans market than any of its rivals. So successful was Muse Air that even Continental's service to and from IAH was less attractive the moment Muse Air offered more flights than Continental beginning the second quarter of 1986.

Nevertheless, the challenger, Continental, seemed to have chosen an appropriate time to enter the HOU-MSY market in that it entered the quarter when Southwest had already reduced frequency to a low of seven departures per day each way (Figure 6.133). Yet, considering the low introductory fares, passengers did respond very well to

the new service between HOU and MSY since one can see, from Figure 6.131, that Continental immediately captured close to 40,000 passengers in the first quarter it inaugurated the service. In the ensuing quarters, Continental saw a sharp increase in OD traffic on its flights even though it raised fares slightly and reduced frequency by two flights per day in each direction. The most unusual observation is that by competing with itself, Continental soon realized that its service between HOU and MSY was more popular than that between IAH and MSY despite the wider choice of flights available at IAH. Unfortunately, Continental's success was short-lived because air travelers were flocking to Southwest again as Southwest rapidly boosted frequency between HOU and MSY beginning in the third quarter of 1987. The success of this change explains the right-half of the 'V' in Figure 6.131. Then, an increase in OD traffic was also observed for Continental's service between IAH and MSY even though frequency remained virtually unchanged, thereby hinting that perhaps there was some general increase in demand in air services in the late 80s. With the discontinuation of Continental's service between HOU and MSY at the end of the third quarter of 1988, the Houston-New Orleans market was only served by two airlines, one in each of the parallel markets: Southwest in the HOU-MSY market, Continental in the IAH-MSY market. While each airline did not have to contend with competition within the same market, competition between the airports was evident in that passengers were still primarily attracted to the significantly higher frequency of services available at HOU.

Airlines' Response To Challengers

The incumbent airlines' response to the challenger's entry in the HOU-MSY market ranged from a reduction in frequency in preparation for an exit to a dramatic boost in frequency. With reference to airlines operating between HOU and MSY, one sees, from Figure 6.133, that Muse Air had reduced its frequency just as it was about to leave the market, while Southwest boldly responded to the potential threat from Continental by increasing frequency from seven flights per day each way in the second quarter of 1987 to 16 by the second quarter of 1989. Its aggressive efforts seemed to have paid-off in that it may have driven Continental out of the HOU-MSY market. Since Continental did not match Southwest's frequency, it carried significantly fewer passengers than Southwest, and finally abandoned operations in the HOU-MSY market at the end of just seven quarters. As though an independent entity, Continental maintained its frequency in the IAH-MSY market and noticed that doing so did not adversely affect the size of the OD traffic in that market.

However, Southwest was not unreasonable in boosting frequency after Continental's entry in the HOU-MSY market because non-OD traffic grew so significantly that Southwest was able to achieve load factors that were in excess of 60% after the first quarter of 1987, with a roughly even split between OD and non-OD traffic. Continental faired poorly in the HOU-MSY market in that, without hub-operations at HOU, it captured fewer non-OD passenger than OD passengers. Perhaps it made a decision to withdraw services in this market when it looked at the dismal load factors that ranged between the mid-50s and the mid-30s. On the other hand, Continental was most likely content with its IAH-MSY services because the large and growing number of non-OD passengers had helped it achieve impressive load factors that ranged from the upper 50s to the 60s.

Concluding Remarks

All in all, one can confidently say that the entry of the challenger did stimulate travel between the two cities since there is a visible jump in total OD traffic in the first quarter of 1987 (Figure 6.136). However growth was not readily evident as the total OD traffic had not increased significantly over the 10 years. Regardless, one may conclude that HOU, the more accessible airport, is preferred for travel between Houston ad New Orleans because of the higher frequency of service and the lower fares offered by Southwest. OD traffic between IAH and MSY is substantial and cannot be ignored. The anomaly - the 'V' shaped profile - could be explained if one knew something about the economic situation at that time. Otherwise, it is worth noting how Southwest could react so quickly and effectively to a challenger who saunters onto its turf. Unlike the Chicago-Des Moines and Chicago-Omaha markets, the air travelers did benefit from the consistently low fares offered by Southwest. Continental's entry into the HOU-MSY market with lower fares did not lower Southwest's average fares; instead, Continental's average fares had crept up to match Southwest's by the second quarter of 1988, the quarter before Continental withdrew services between HOU and MSY.

Figure 6.131 Houston-New Orleans: Smoothed Quarterly OD Traffic

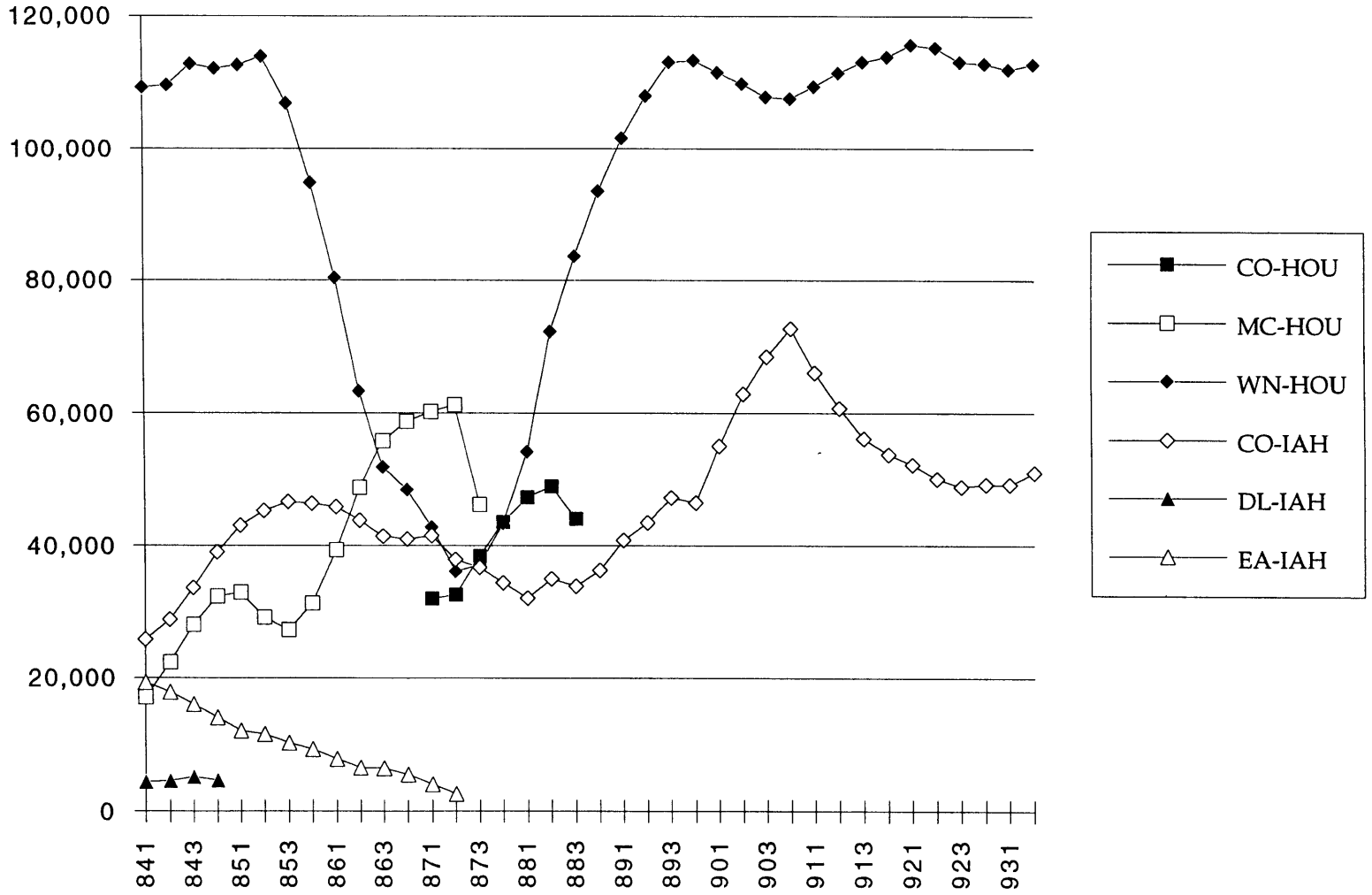


Figure 6.132 Houston-New Orleans: Average One-Way Fare ($)

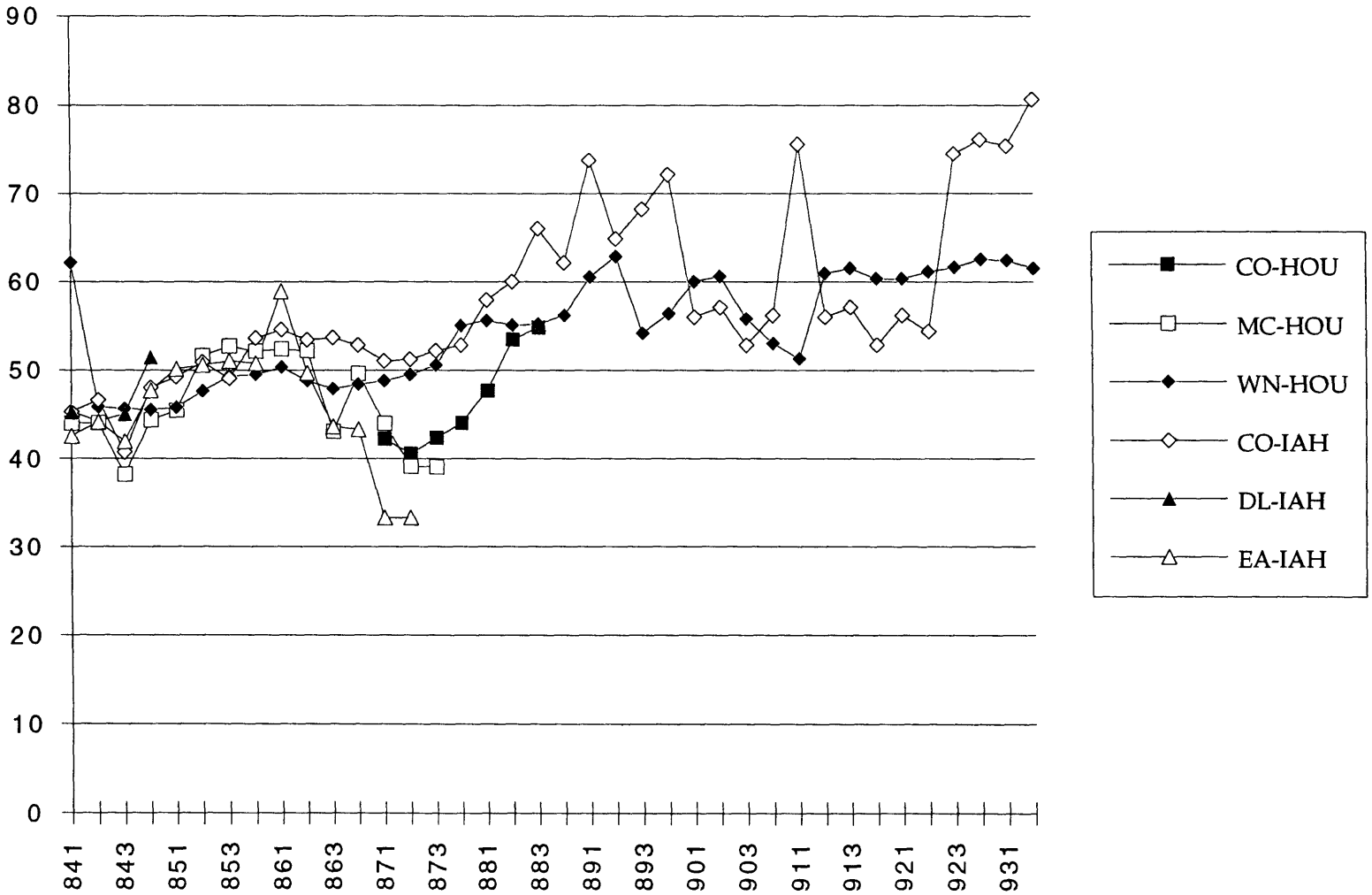


Figure 6.133 Houston-New Orleans: Average Number Of Departures Per Day Each Way

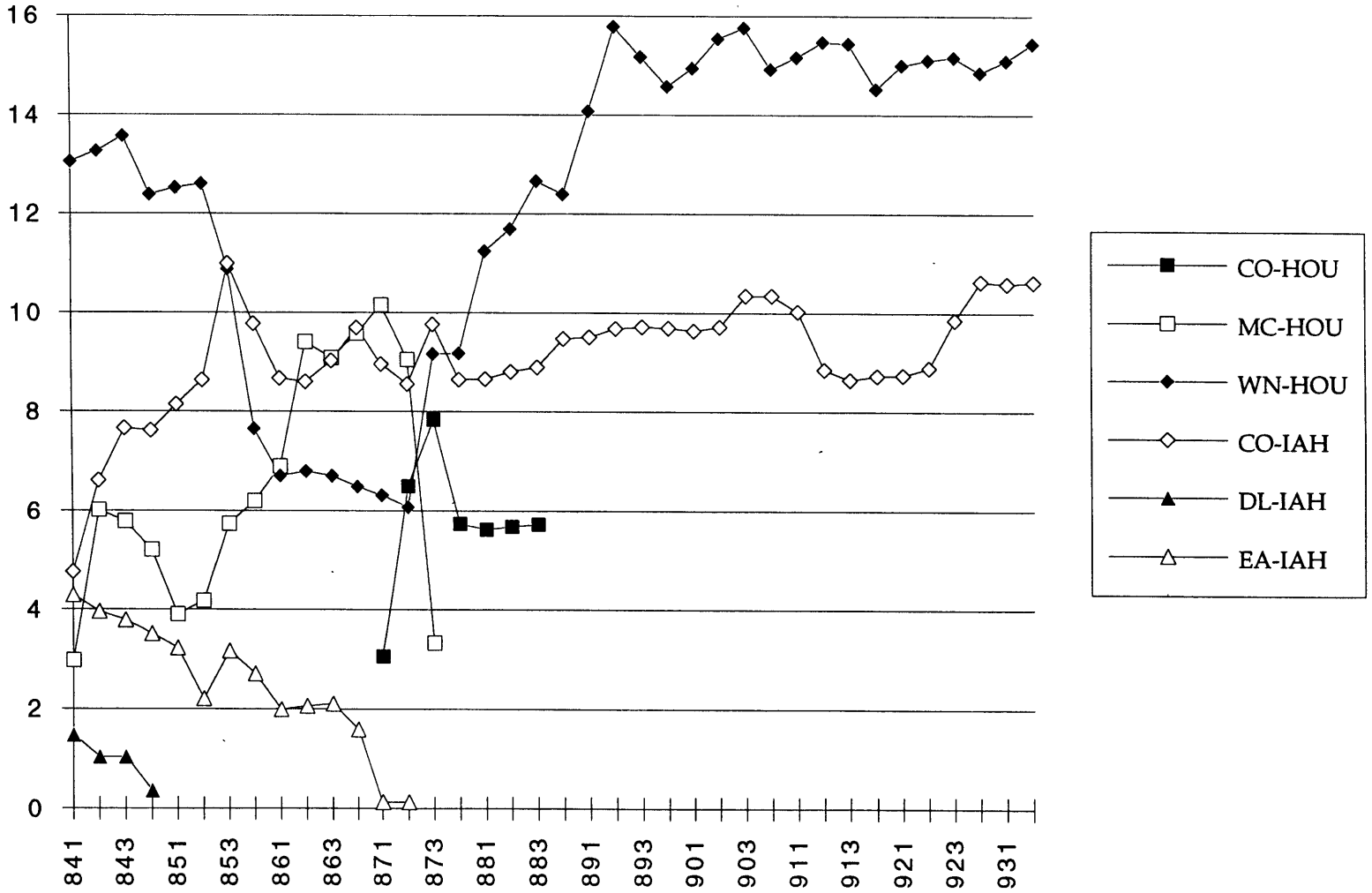


Figure 6.134 Houston-New Orleans: Smoothed Quarterly Non-OD Traffic

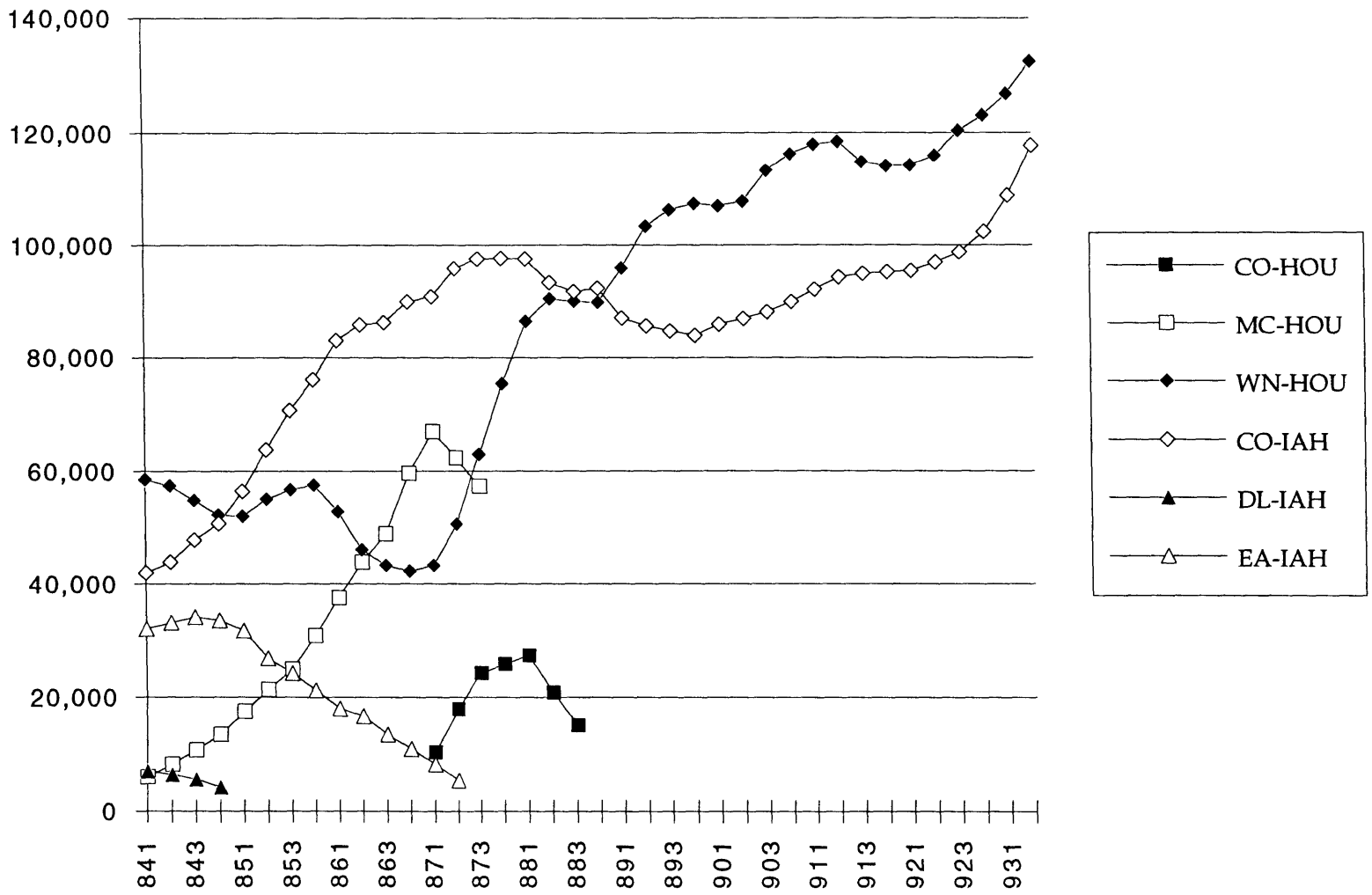


Figure 6.135 Houston-New Orleans: Average Quarterly Load Factor (%)

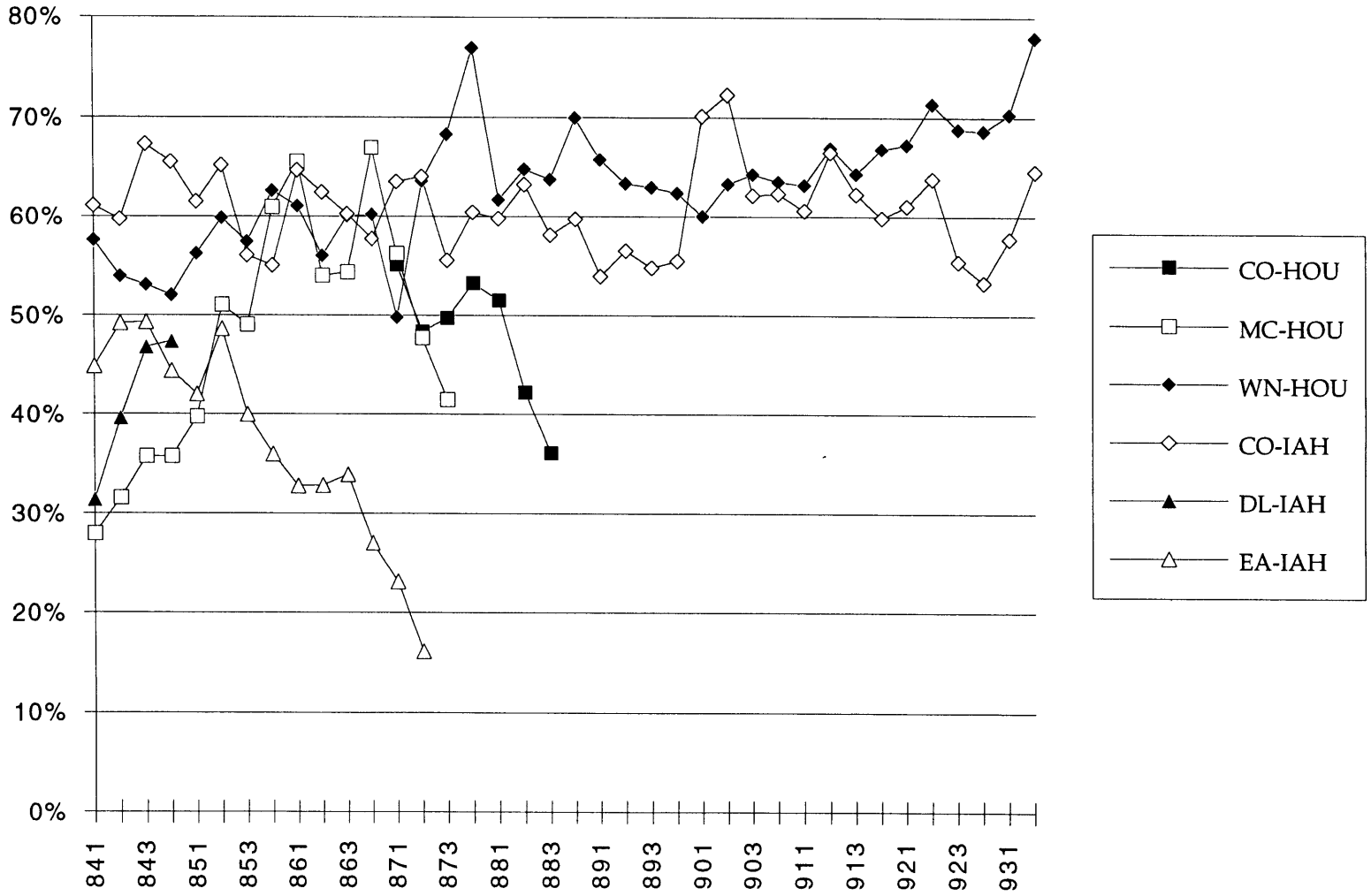
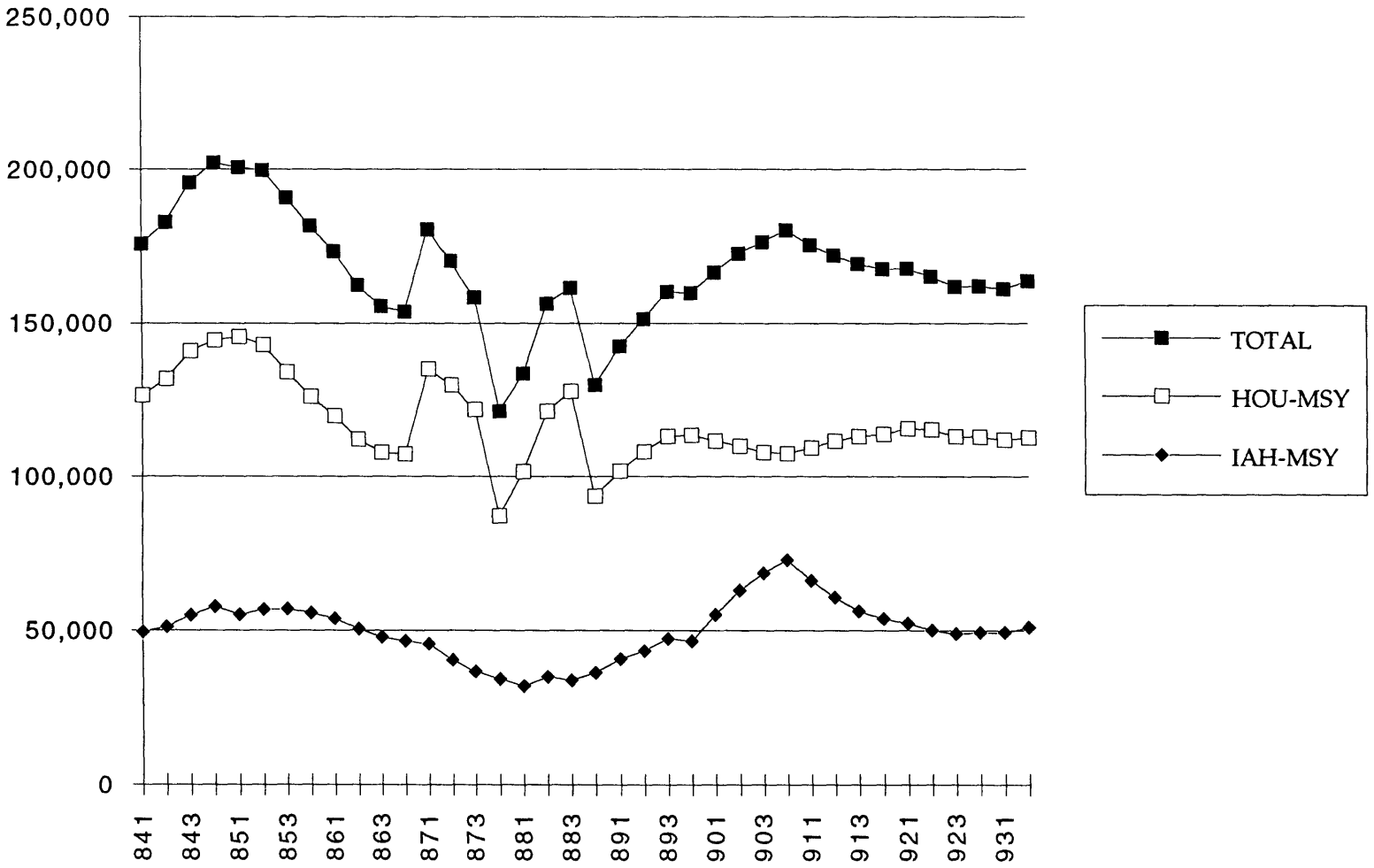


Figure 6.136 Houston-New Orleans: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.14 Scenario 1: Houston-San Antonio (HOU/IAH-SAT, Distance = 191 miles)

Preliminary Remarks

The OD traffic profile for the airlines in the Houston-San Antonio market is reminiscent of that in the Chicago-Des Moines and Chicago-Omaha markets in that each carrier occupies its own niche, with few intersections between the curves (Figure 6.141). In addition, Figure 6.146 reveals that the total OD traffic did not grow significantly between 1984 and 1993. However, the Houston-San Antonio market is of interest as there is just one challenger in each of the parallel markets: Continental challenged Southwest in the HOU-SAT market while USAir challenged Continental in the IAH-SAT market. Eastern, which was not a big player in the IAH-SAT market, had already displayed signs of retreat, particularly when it secured ailing load factors that plunged from the 30s to just over 10% (Figure 6.145).

Passengers' Response To Challengers

The first challenger, USAir, did not attract many OD passengers in the Houston-San Antonio market when it entered the market in 1985 because OD air travelers did not consider the limited twice-a-day service alluring (Figure 6.141) despite the initial offer of fares that were slightly lower than Southwest's (Figure 6.142). Even Eastern, which offered lower fares than USAir in the first and second quarters of 1985, secured more passengers than USAir because of the higher frequency. However, as Eastern reduced frequency and raised fares in the first quarter of 1986, it lost passengers, particularly when USAir's lowest fares in the market had been put in place to lure passengers away from Eastern. However, one may speculate that the noticeable decline in Southwest's OD traffic could be attributed to Southwest's reduction in frequency in the third quarter of 1985 (Figure 6.143) and Continental's corresponding increase in frequency in the parallel market of IAH-SAT. Otherwise, as a minor player, USAir, which was operating between IAH and SAT as an extension of a service between Philadelphia and IAH, could easily undercut all its competitors' fares because it knew that it could not offer a high frequency of service between the two cities. In other words, USAir was not attempting to attract a huge pool of OD traffic between IAH and SAT, but would be happy to accommodate OD air travelers who were not sensitive to frequency and time of departure. Yet, the fact that some OD air travelers did respond to its marketing efforts implies that USAir's entry was not completely futile.

On the other hand, Continental's entry in the HOU-SAT market in the fourth quarter of 1986 did not result in a sudden increase in OD traffic between HOU and

SAT. Instead, OD traffic built-up over the next four quarters as though Continental had to nurture the market. Despite offering a very low introductory fare of just below $20, passengers did not all immediately flock to Continental since it offered about one-third the frequency of its rival (Southwest). However, Continental's new service between HOU and SAT seems to have diverted some OD traffic from its own IAH-SAT market as Figure 6.141 shows. In the subsequent four quarters, Continental was able to capture more OD passengers in the HOU-SAT market even though it raised fares while maintaining the frequency of about three flights per day each way - perhaps because the fare was still lower than Southwest's or its own fare in the IAH-SAT market. However, between the fourth quarter of 1988 and the fourth quarter of 1989, Continental's OD traffic in the HOU-SAT market then declined since it raised its fares above that of Southwest and did not simultaneously increase frequency significantly. It achieved a moderate recovery in OD traffic in the HOU-SAT market between the first and third quarters of 1990 - when frequency was increased marginally and fares reduced to below that of Southwest's. However, with a sharp reduction in frequency in the first quarter of 1991 and the loss of OD traffic in the subsequent two quarters, Continental finally discontinued service between HOU and SAT. Compared to its service between IAH and SAT, the HOU-SAT services were lagging behind in terms of traffic; air travelers, by far, preferred its seven or eight flights per day at IAH, as opposed to its smaller presence in the HOU-SAT market. Continental's only rival in the HOU-SAT market, namely Southwest, did not suffer from a diversion of OD traffic since it recorded a healthy increase in OD traffic in the quarters after the fourth quarter of 1986. If Continental's entry in the HOU-SAT market did stimulate travel, then the stimulative effect of the new service was delayed as can be seen by the gradual build-up in the OD traffic during the first four quarters after its entry (Figure 6.141).

Airlines' Response To Challengers

The entry of USAir did seem to instigate both Continental (IAH-SAT) and Southwest (HOU-SAT) to boost frequency quite significantly in the two quarters immediately after USAir's entry. While USAir achieved a moderate increase in OD traffic in the six quarters after the first quarter of 1985, Southwest saw a sharp decline in OD traffic and Continental (IAH-SAT), a marginal decrease within the same period. USAir maintained its frequency for four years, unperturbed by the entry of Continental in the HOU-SAT market in the fourth quarter of 1986. On the other hand, both Southwest (HOU-SAT) and Continental (IAH-SAT) had gradually increased frequency over the years perhaps more in tandem with market demand than because of the entry

of the two challengers. It is clear from Figure 6.143 that since the two challengers were not attempting to match the high frequency offered by Southwest and Continental (IAH-SAT), they were not a genuine threat to the strong incumbents.

Justification for the increase in frequency for Southwest and Continental (IAH-SAT) seems to lie in the fact that non-OD traffic is sizable for these two carriers. For Southwest, an airline that has a presence at Hobby but not a strong interstate network emanating from Hobby, the size of the non-OD traffic was typically only half that of the OD traffic. Continental, with its extensive hub-operations at IAH, achieved an impressive growth in non-OD traffic from a low of 40,000 in the first quarter of 1984 to a high of 130,000 in the second quarter of 1993. In fact, non-OD traffic was usually more than twice the size of the OD traffic, thereby accentuating the importance of connecting traffic in helping Continental sustain its service between IAH and SAT. Nevertheless, in spite of the difference in passengers mix, both Southwest and Continental (IAH-SAT) secured high load factors that hovered around 60% most of the time. USAir, on the other hand, which captured a relatively small number of non-OD and OD traffic, had to contend with appalling load factors that fluctuated between the upper teens and early 40s. Continental's service between HOU and SAT did attract more non-OD passengers than OD passengers, but this did not really boost load factors beyond 50%. It was probably prudent of Continental to abandon the service between HOU and SAT once load factors plummeted to about 20% in the first two quarters of 1991, particularly when Continental could see that the services between IAH and SAT were yielding better load factors for the frequency of service that it offered. Passengers who had chosen to fly Continental were still responding to the higher frequency offered at IAH, not the lower fares at HOU.

Concluding Remarks

While the Houston-San Antonio market may not be characterized by significant growth or traffic stimulation, one may infer, from Figure 6.146, that Continental's new service between HOU and SAT may have diverted some OD traffic away from the IAH-SAT market, particularly between the first quarter of 1987 and first quarter of 1989. However, like the Houston-New Orleans market, Continental realized that it was not feasible to maintain both HOU-SAT and IAH-SAT services because Continental could only well sustain high frequency services between its sizable hub at IAH and SAT. Unless the HOU-SAT market were also served with a high frequency of service that was comparable to that at IAH, passengers are likely to choose to fly Southwest into and out of HOU, or Continental into and out of IAH, depending on accessibility concerns. With

the slight frequency advantage of HOU and the larger proportion of OD traffic flying between HOU and SAT, one may correctly infer that higher frequency, better accessibility and lower fares do give HOU an advantage over IAH when it comes to travel between Houston and San Antonio.

Figure 6.141 Houston-San Antonio: Smoothed Quarterly OD Traffic

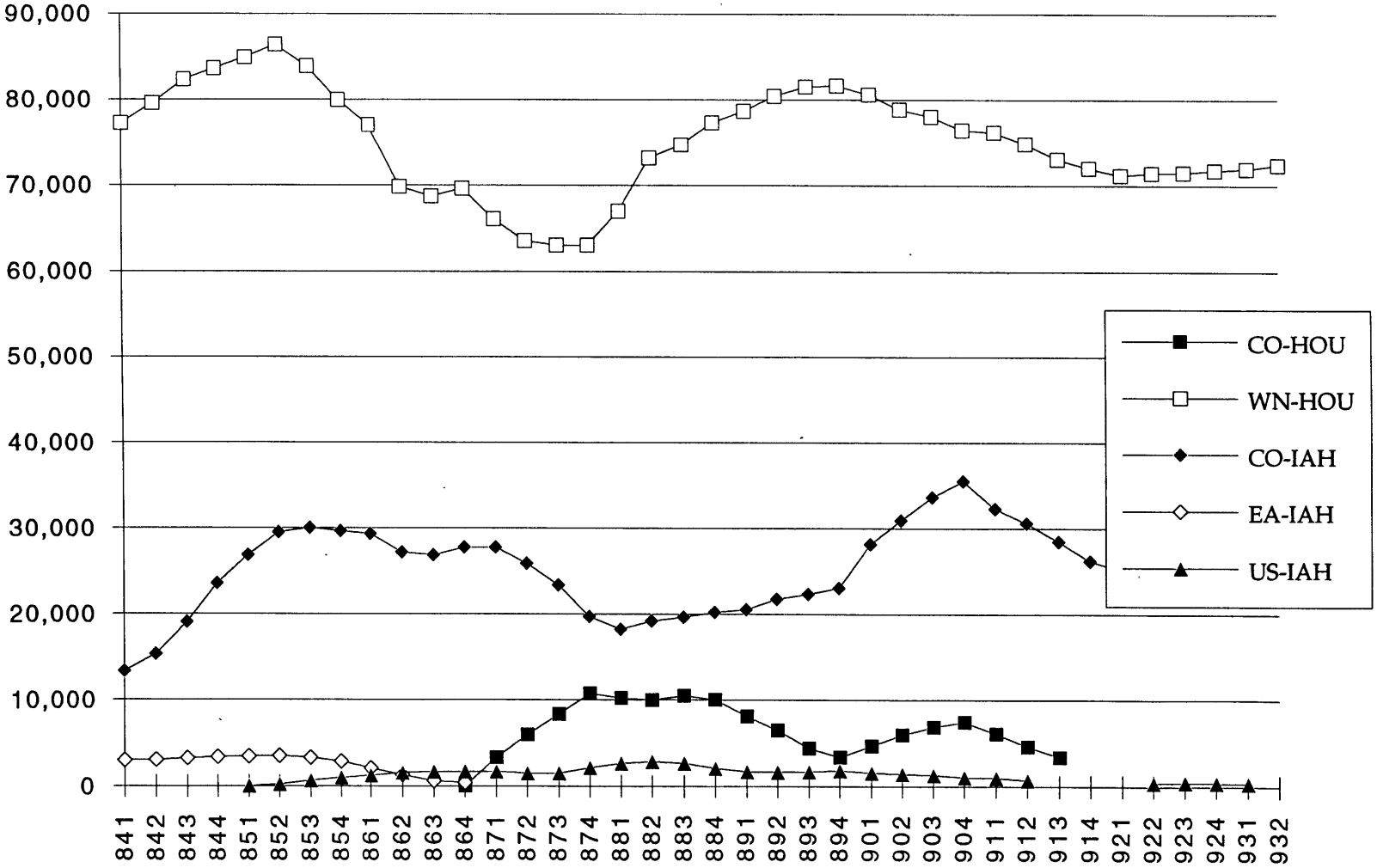


Figure 6.142 Houston-San Antonio: Average One-Way Fare ($)

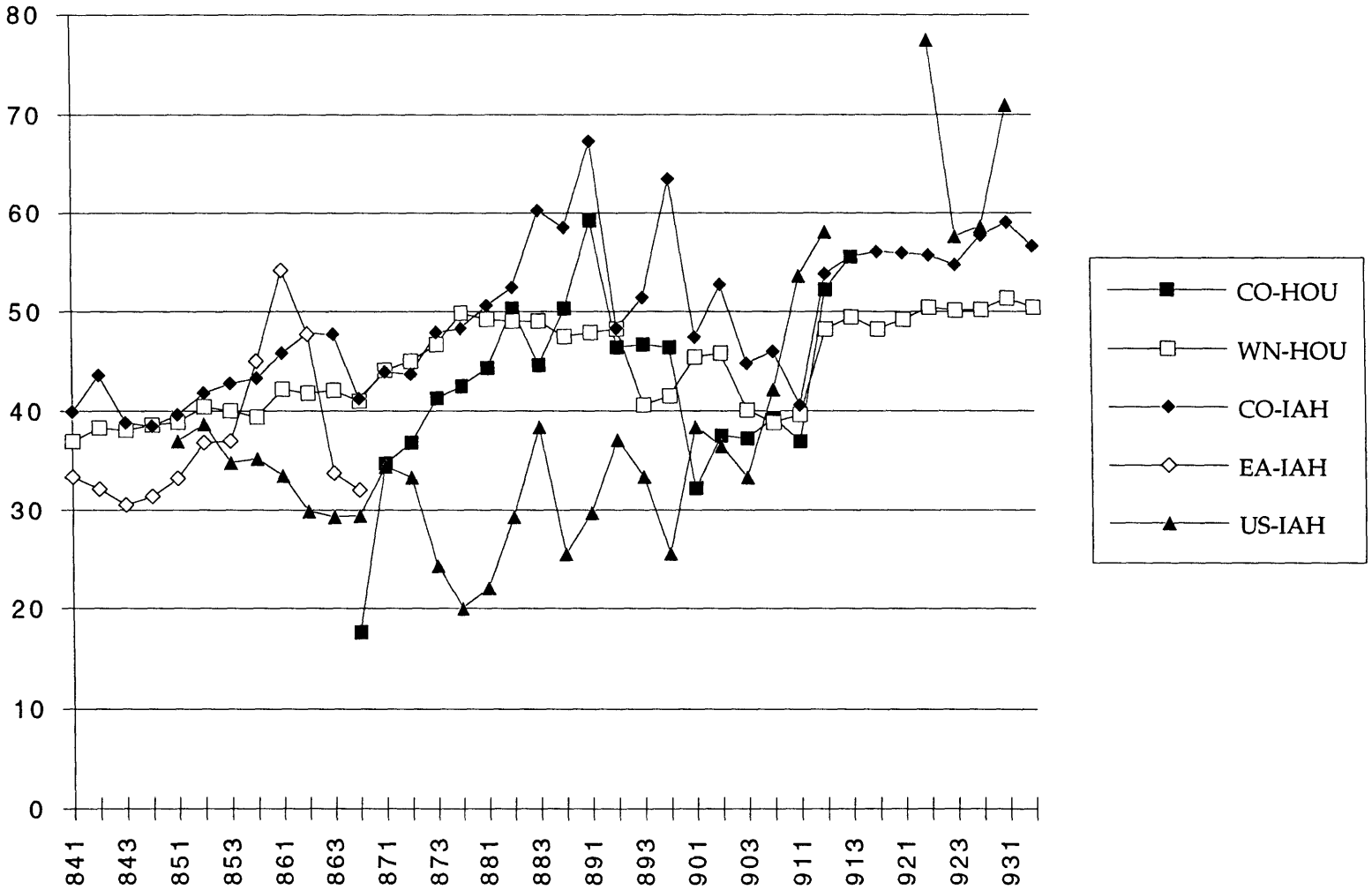


Figure 6.412 Chicago-Detroit: Average One-Way Fare ($)

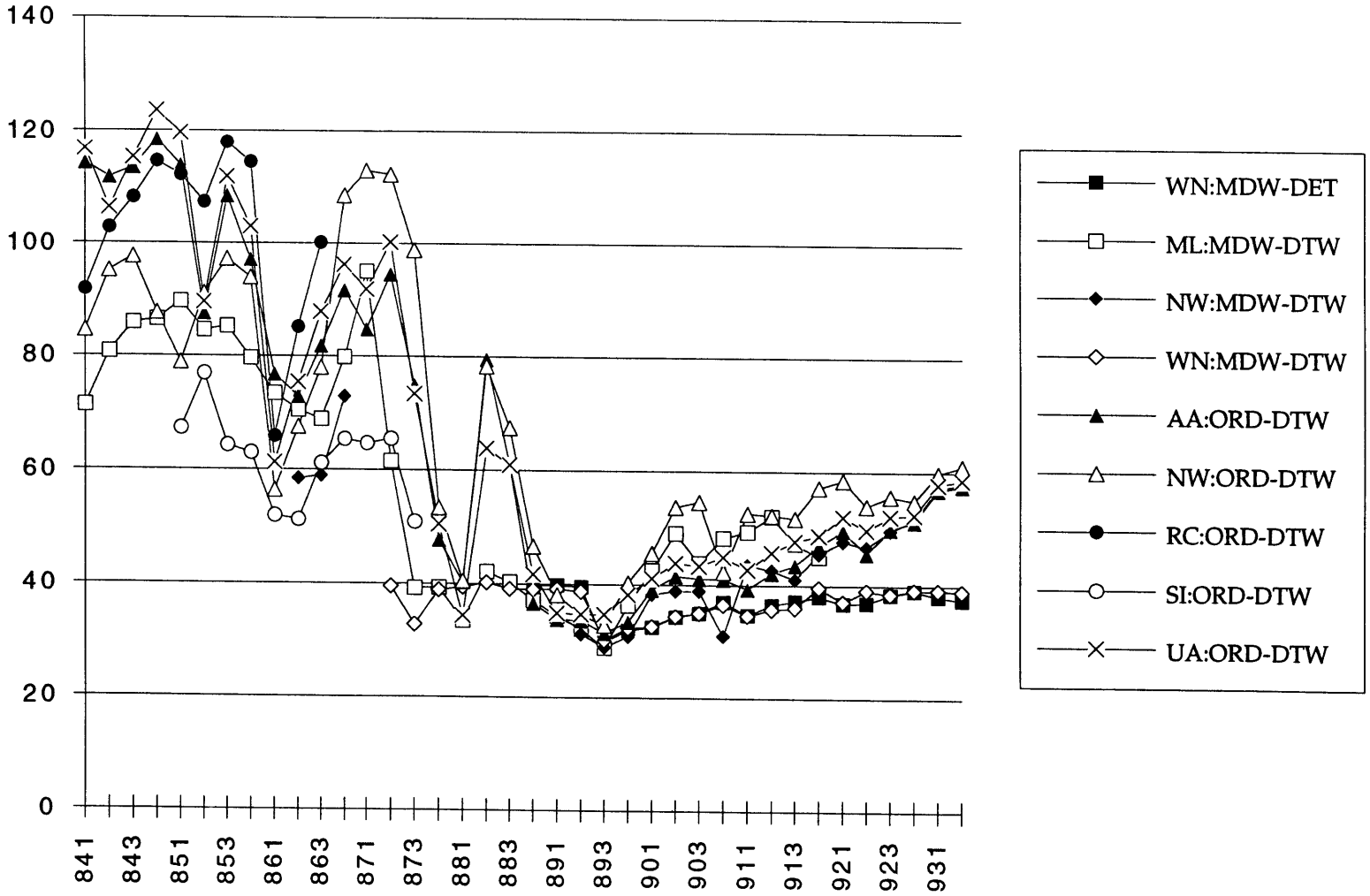


Figure 6.411 Chicago-Detroit: Smoothed Quarterly OD Traffic

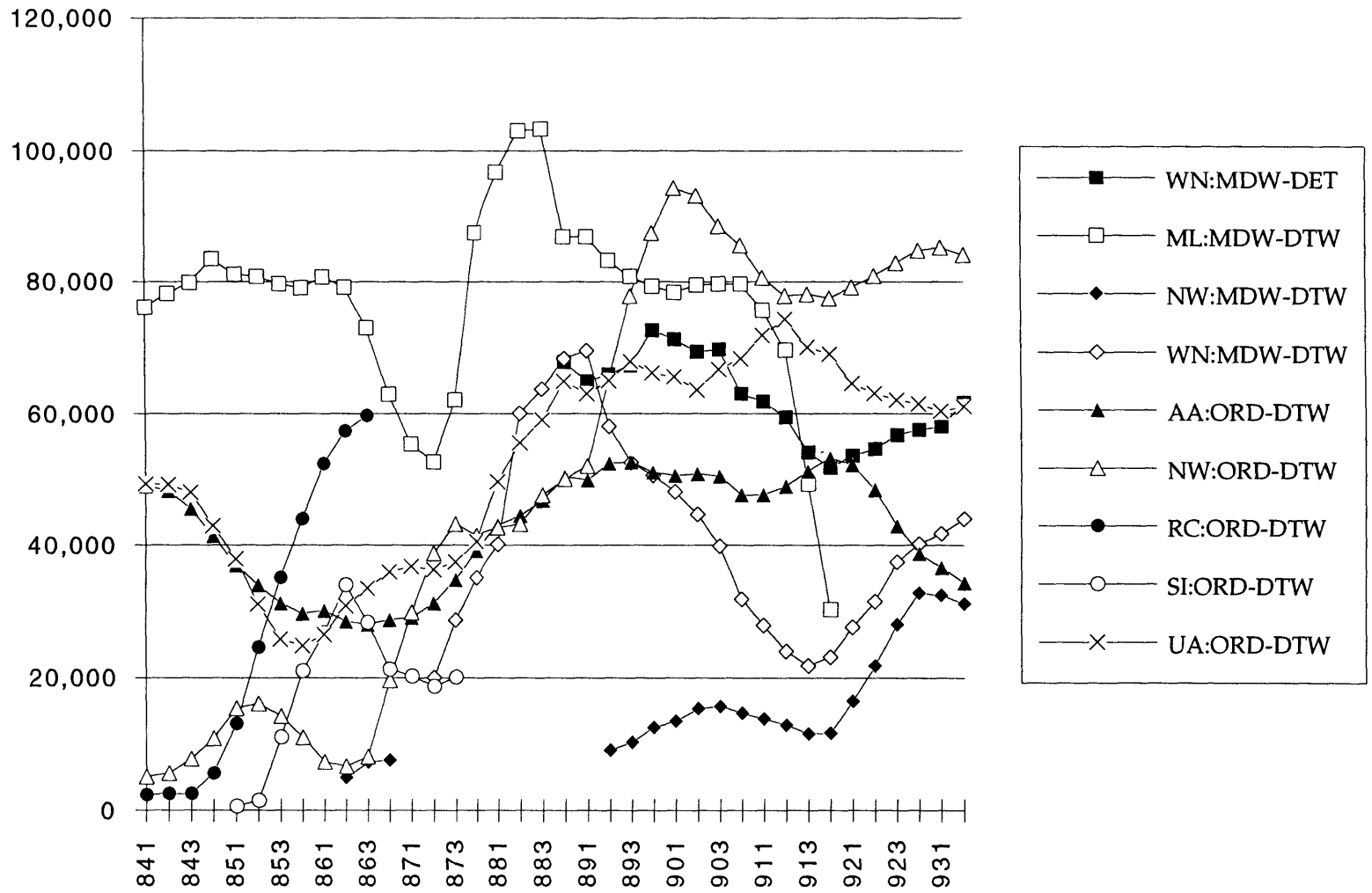


Figure 6.143 Houston-San Antonio: Average Number Of Departures Per Day Each Way

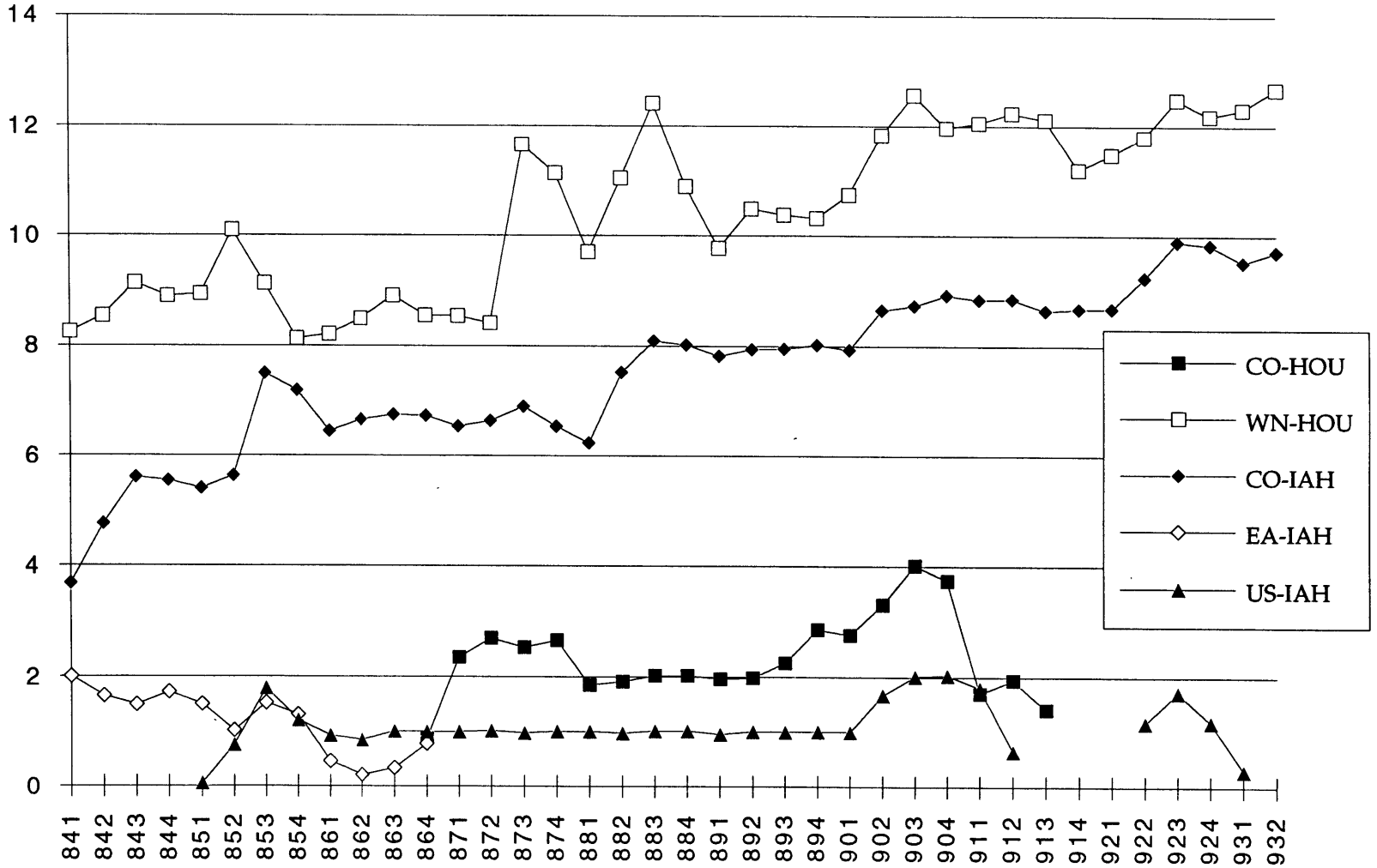


Figure 6.144 Houston-San Antonio: Smoothed Quarterly Non-OD Traffic

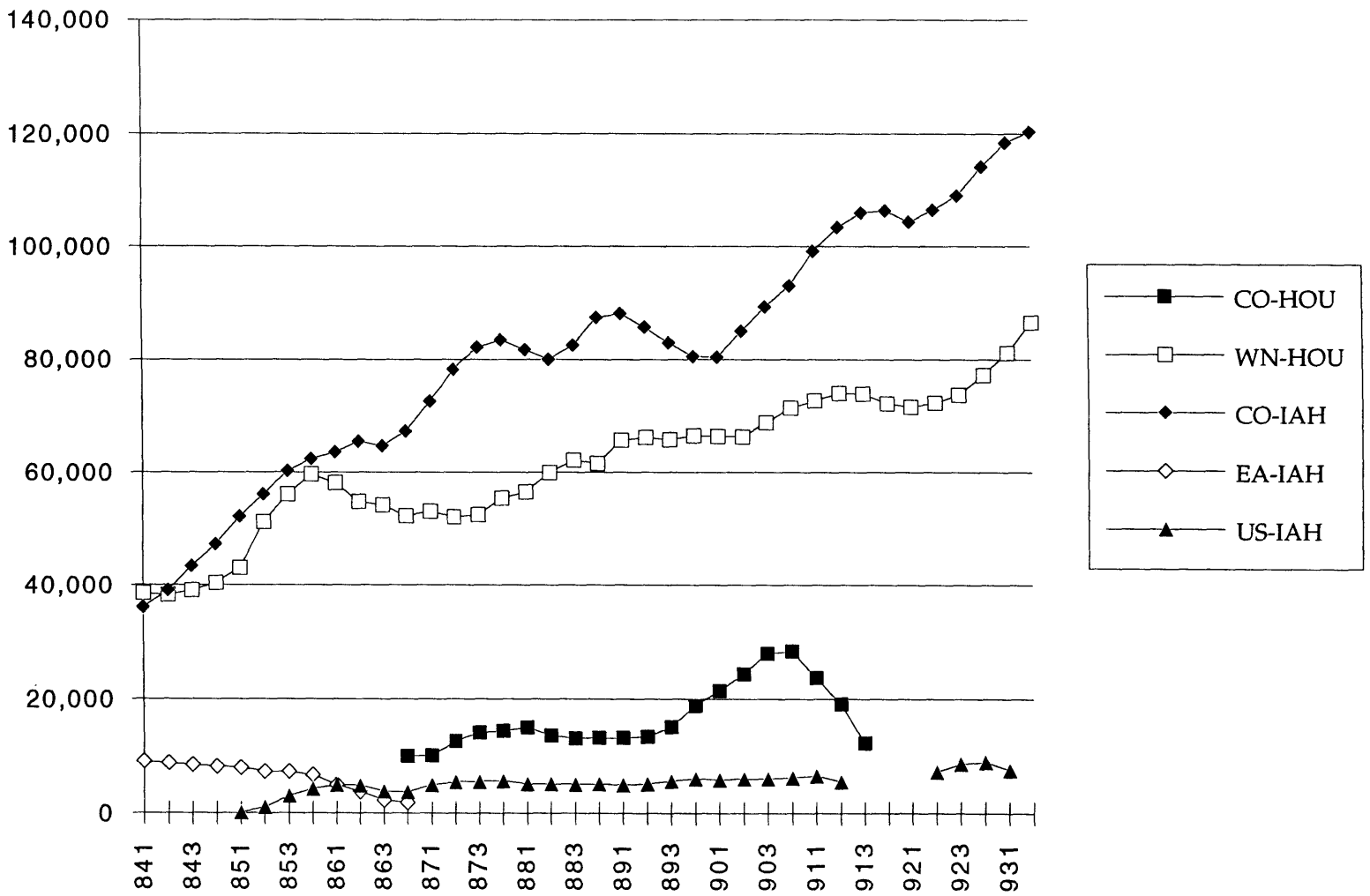


Figure 6.145 Houston-San Antonio: Average Quarterly Load Factor (%)

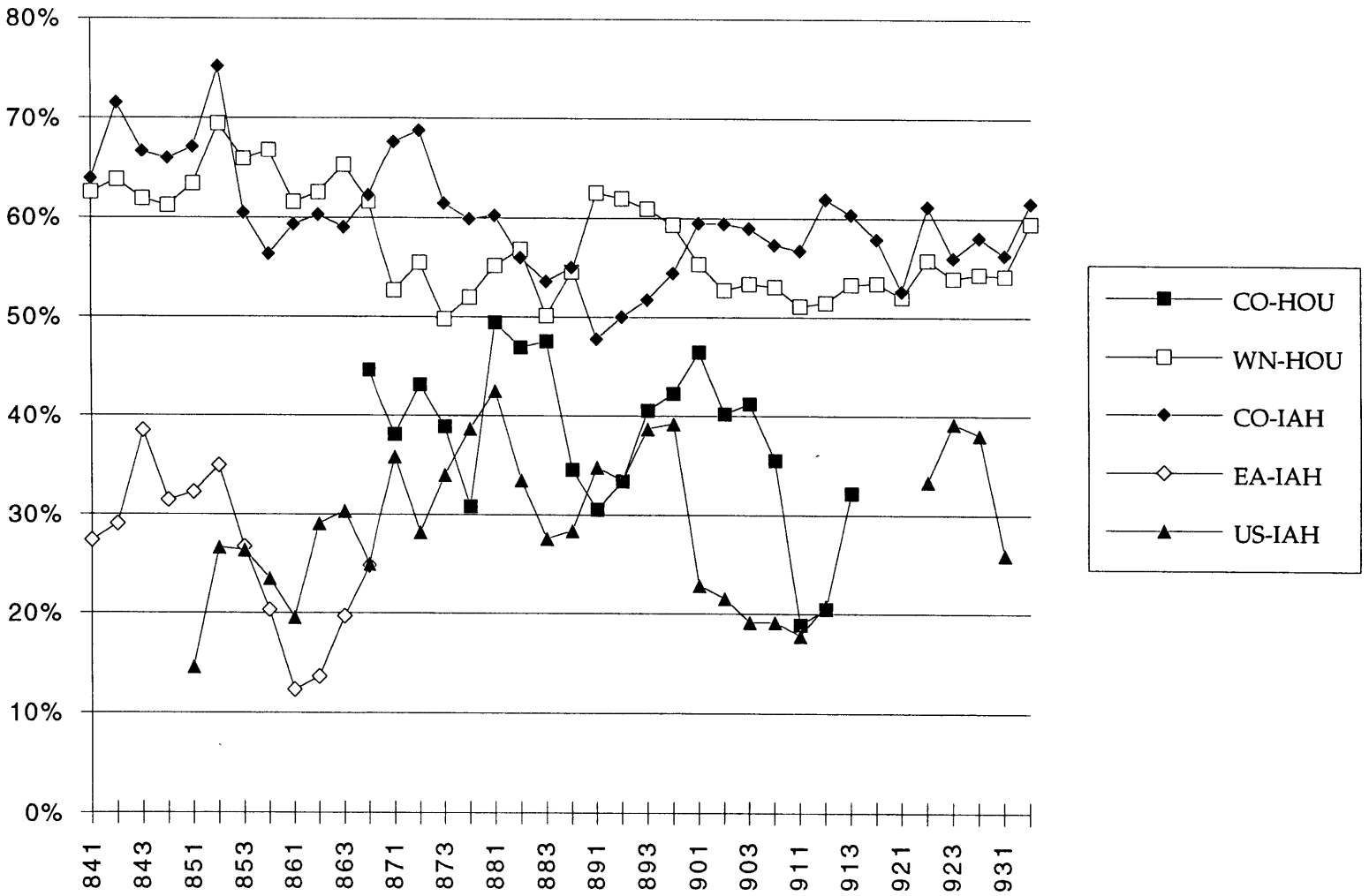
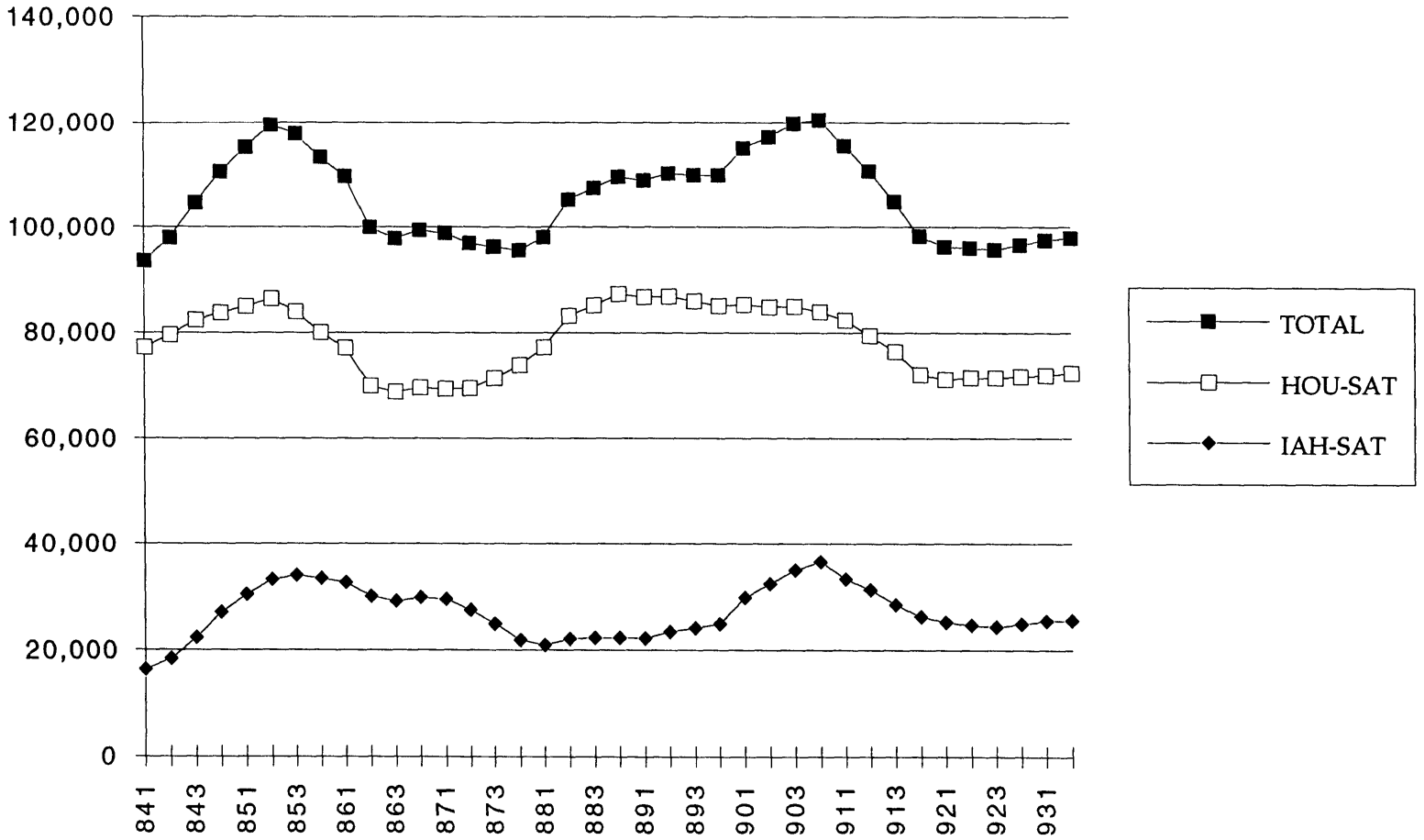


Figure 6.146 Houston-San Antonio: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.21 Scenario 2: Chicago-Atlanta (ORD/MDW-ATL, Distance = 593 miles)

Preliminary Remarks

In the Chicago-Atlanta market, the two incumbents that are based in Atlanta, Delta and Eastern, were challenged by three airlines that are based in Chicago: American and United at O'Hare, and Midway Airlines at Midway. Figure 6.211 revealed that significant stimulation of the OD traffic was present each time a challenger entered the market, thereby bringing about robust growth in air travel between Chicago and Atlanta, particularly between the second quarter of 1984 and the first quarter of 1991. While the economic link between the two cities may be a contributing factor to the growth in the travel market, the provision of frequent air services between the two cities had probably fueled the growth as well.

Passengers' Response To Challengers

Prior to the entry of the first challenger in the second quarter of 1984, Delta and Eastern were the only providers of nonstop services between ORD and ATL. Passengers did not have a choice of airports to consider. However, more passengers flew Delta than Eastern, for the same fare, because Delta offered eight departures per day each way whereas Eastern, only five. Although United's entry in the ORD-ATL market with about four departures per day each way did not offer passengers air service from a different airport in the Chicago area, United was well able to stimulate travel since it captured its own share of OD traffic without causing any diversion of traffic from the incumbents of Delta and Eastern (Figure 6.211). Since its entry, United had achieved a continuous, steady increase in OD traffic from a low of about 5,000 passengers in the second quarter of 1984 to a high of 40,000 passengers in the second quarter of 1993, an eight-fold increase in OD traffic. An interesting anomaly is that United captured as many passengers as Eastern in 1985 and 1986 and more than Eastern after 1987 even though it consistently offered fewer departures (four or five) than Eastern (six to seven). As United's average fares (Figure 6.212) were not always lower than Eastern's, one may not conclude that passengers chose United on the basis of fares either. Yet, Eastern did not see much growth in OD traffic over the years, whereas United did.

American's entry was more successful than United's in that it managed to immediately secure a huge OD traffic share of just over 15,000 passengers in the second quarter of 1985, the quarter it initiated the challenge at ORD. With four airlines operating between ORD and ATL, one can only be amazed at how each of the four airlines was able to capture its own share of the OD traffic without hurting its rivals.

Indeed, American lost some of its OD traffic in the seven quarters after it initiated the challenge but soon achieved an upturn in OD traffic after the first quarter of 1987. By the end of the second quarter of 1993, it had carried as many as 30,000 passengers, which is far from what it had started out with (around 16,000). Although American closely matched United's frequency of service, it captured fewer passengers than United throughout the years examined (Figure 6.211). Again, since average fares were quite similar, it may be difficult to pin-down the exact reason for the observed discrepancy. However, it is clear, by looking at Figure 6.211, that Delta, which could boast of its frequency leadership, attracted the most number of passengers amongst the four carriers operating between ORD and ATL.

The last challenge was initiated by Midway, an airline that pioneered the parallel market of MDW-ATL. Accordingly, passengers now had a choice of flying into or out of the more accessible airport of the Chicago area. By comparison, Midway alone brought in close to 25,000 passengers in its first quarter of operations between MDW and ATL - more than the number of passengers the other two challengers at ORD could capture in their first quarter of operations. A check with Figure 6.211 revealed that Midway's entry did not steal away passengers from United, American or Eastern, but Delta momentarily lost some passengers in the three quarters after Midway's entry. Midway's offer of a very low introductory fare and the lowest frequency of just three flights per day did not put it at a disadvantage at all since passengers did respond favorably to its new service. United had lowered its fares in 1988 to match Midway's but was not successful in causing a diversion of OD traffic until the last quarter of 1984, when Midway's OD traffic dipped below that of United's for the first time, and continued to do so in the subsequent quarters. In the early 90s, when American matched Midway's frequency for a short while, passengers were indifferent between American and Midway, but by the time Midway was preparing for its exit and that Eastern had left, passengers were choosing Delta, United or American, the three airlines that continued to offer service between Chicago and Atlanta.

Airlines' Response To Challengers

Delta did not react to the entry of the three challengers by drastically altering the frequency of service. United, the first challenger, almost matched Eastern's frequency when it entered the ORD-ATL market (disregard first quarter of 1984). This subsequently may have instigated Eastern to boost frequency from five departures in the third quarter of 1984 to six departures per day each way in the fourth quarter of 1984 (Figure 6.213), which, unfortunately, did not result in any significant gain in OD traffic.

United, on the other hand, achieved an increase in OD traffic by maintaining frequency over the same period. In American's first full quarter of operations between ORD and ATL (disregard second quarter of 1985), American had attempted to match Delta's frequency of eight departures per day each way and offer a lower fare, but since it did not capture as large a number of OD passengers as Delta, it gradually reduced its frequency from eight to three departures per day by the second quarter of 1986. To counteract the decline in OD traffic and to match United's frequency of service at the same airport, American had finally decided to settle with four departures per day beginning the third quarter of 1986. Apparently, American had learnt that it would not benefit from matching Delta or Eastern's frequency.

Midway dug a niche of its own right from the very beginning. It started out with three departures a day each way and a low introductory fare, and did not seem to have the intention of stirring the 'giants' at ORD. However, the fact that it captured more passengers than United or American in its first five quarters of operations between MDW and ATL may have raised some concern among its close rivals, United and American, because these two carriers did, at certain times, match Midway's frequency (Figure 6.213). However, Midway's success was short-lived because United captured more passengers than Midway by the fourth quarter of 1988, while American caught-up with Midway by the second quarter of 1990.

Delta's justification for offering eight to nine departures per day each way was that it typically carried more than 100,000 non-OD passengers each quarter. With Delta's strong hub at Atlanta, a hub that is well-positioned to tap the Chicago-Southeast traffic, and the large number of OD passengers that it secured, Delta was able to maintain load factors that were above 50%. Like Delta, Eastern, too, carried more non-OD passengers than OD passengers, and was able to sustain load factors that were above 50% despite offering six departures a day each way. Then, by capturing a sizable number of non-OD traffic that was about twice that of the OD traffic, United, the first challenger that has a strong hub at ORD, launched its service with dismal load factors that climbed from the 20s to the 50s within five quarters. Since the second quarter of 1985, United was on its road to success with its load factors that quite often exceeded 60%. Like United, American carried a pool of non-OD passengers that was twice the number of OD passengers, but by offering the same number of departures as United, American achieved lower load factors that merely hovered around 40%, perhaps because of the use of different aircraft type. Midway's new service to and from MDW was less popular among the non-OD passengers; this may be explained by the fact that it had a smaller network emanating from its hub at MDW. Even with the larger number

of OD passengers it carried, Midway failed to secure load factors above 50% despite offering three departures per day each way.

Concluding Remarks

All in all, the Chicago-Atlanta market is definitely one that is characterized by significant stimulation of OD traffic, as can be seen by the sudden increases in OD traffic in the second quarter of 1984, 1985, and 1987, the quarters in which the three challengers entered their respective markets (Figure 6.216). An observation worth noting is that the exit of Eastern resulted in a more noticeable decline in the total OD traffic than the exit of Midway, which perhaps highlights the idea that the demise of Eastern had a more significant impact on air travel between the two cities. Yet, Figure 6.216 seems to indicate that the stimulative effects of the new services was short-lived in that the size of the OD traffic returned to its original level (first quarter 1984) by the time Midway left the market. Nevertheless, flights between ORD and ATL were still preferred over those between MDW and ATL for the reason that more flights were available between ORD and ATL. Frequency drew the majority of the air travelers to ORD and the high frequency of service between the two cities is possible mainly because United, American and Delta have hubs in either ORD or ATL, whereby more flights per day would permit more possible connections for the non-OD passengers.

Figure 6.211 Chicago-Atlanta: Smoothed Quarterly OD Traffic

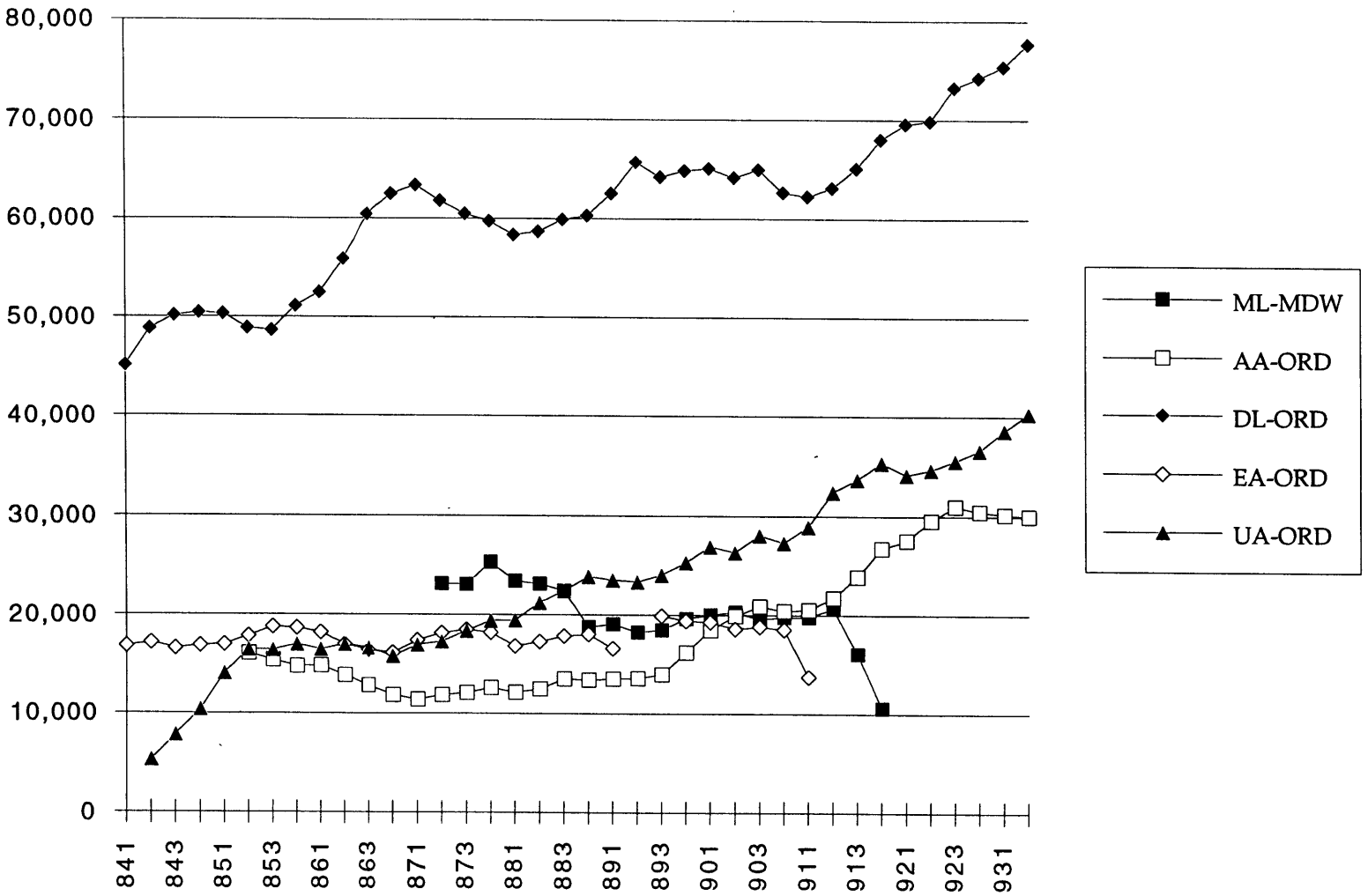


Figure 6.212 Chicago-Atlanta: Average One-Way Fare ($)

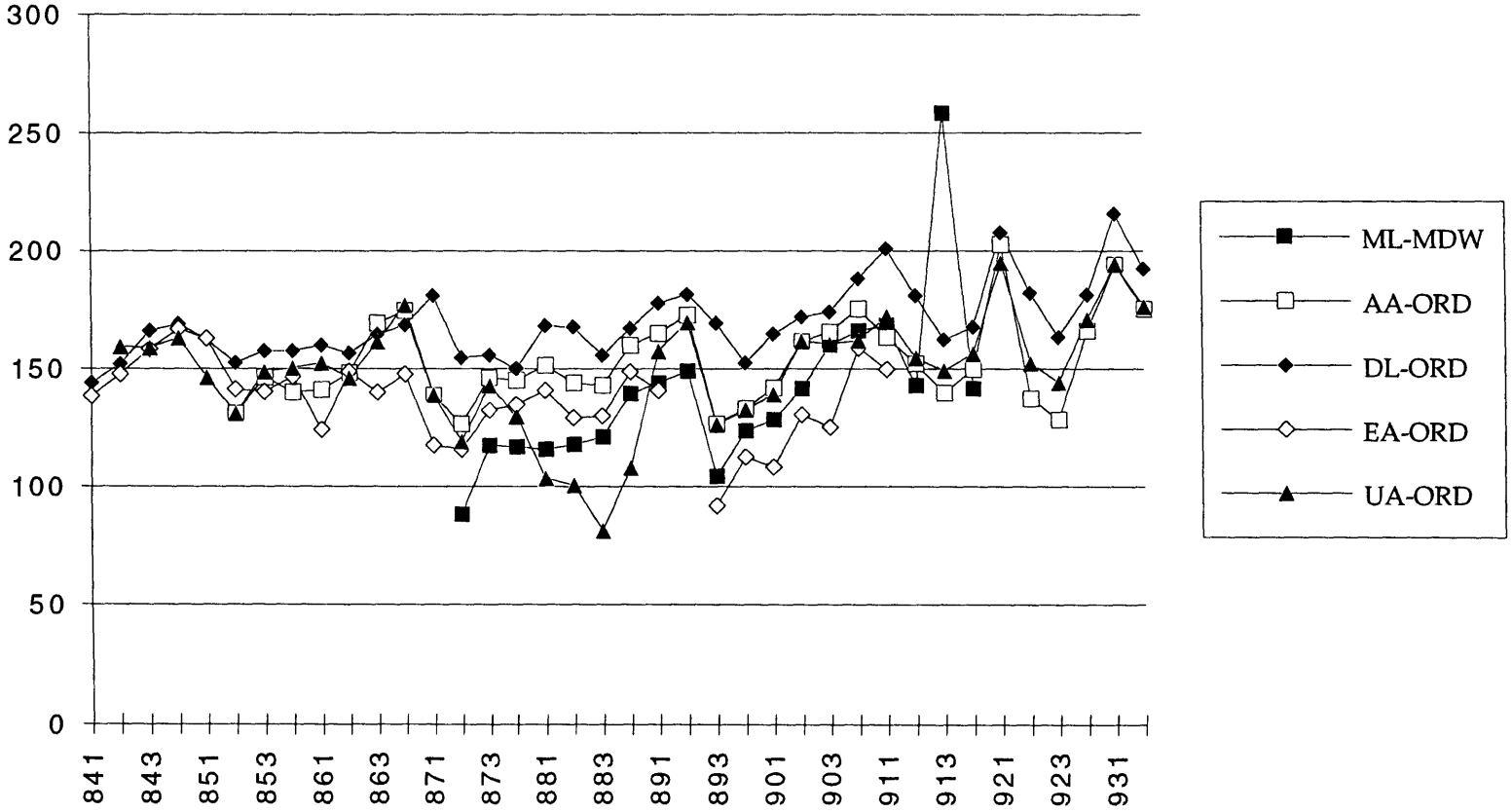


Figure 6.213 Chicago-Atlanta: Average Number Of Departures Per Day Each Way

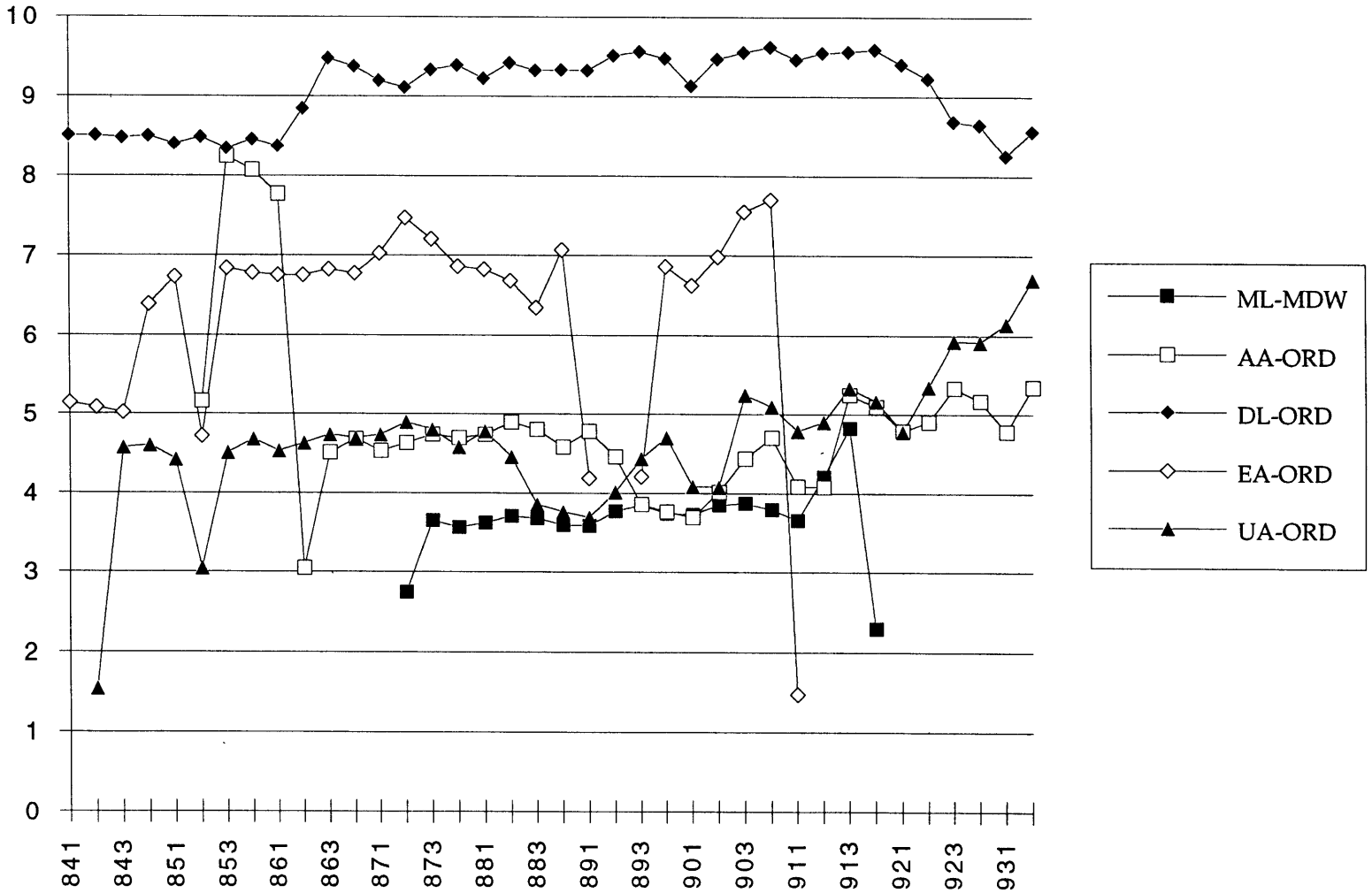


Figure 6.214 Chicago-Atlanta: Smoothed Quarterly Non-OD Traffic

Figure 6.215 Chicago-Atlanta: Average Quarterly Load Factor (%)

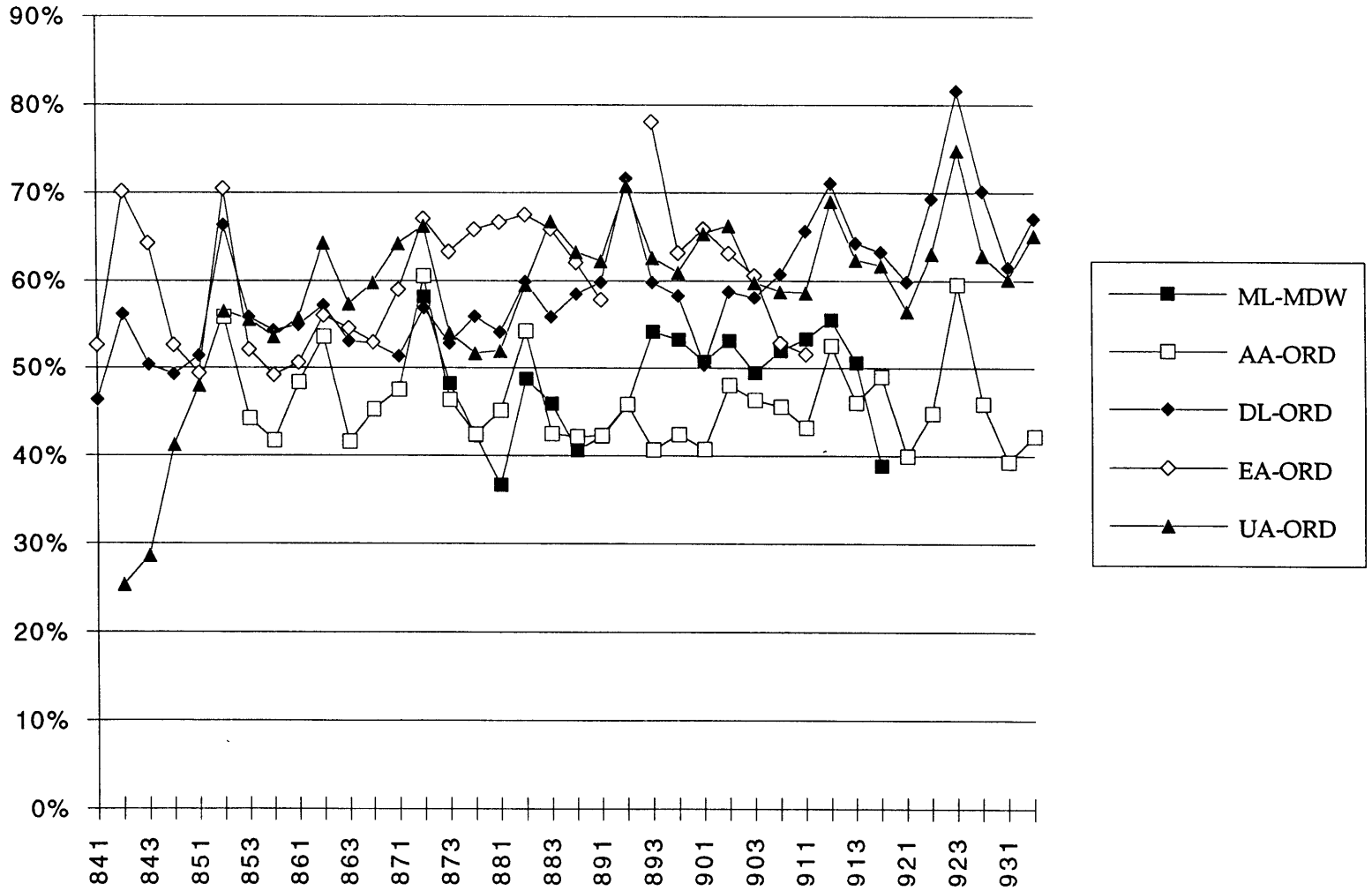
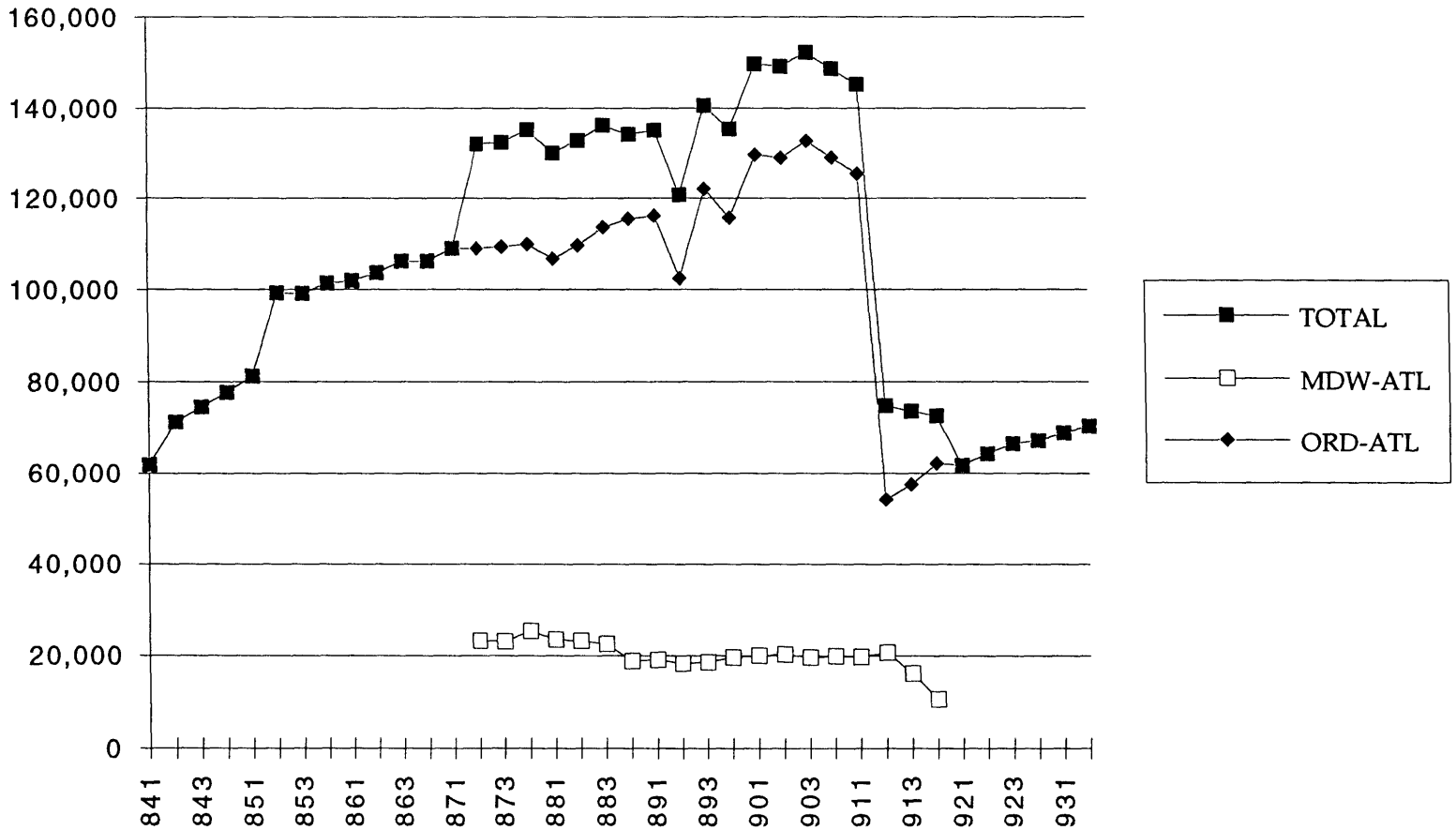


Figure 6.216 Chicago-Atlanta: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.22 Scenario 2: Chicago-Pittsburgh (ORD/MDW-PIT, Distance = 411 miles)

Preliminary Remarks

Similar to Delta and Eastern in the Chicago-Atlanta market, the two incumbents in the Chicago-Pittsburgh market, United and USAir, essentially captured a very large number of OD passengers, while the challengers each occupied a niche of their own. The challengers in the Chicago-Pittsburgh market are: American, which has a hub at ORD; Midway, which has a small hub at MDW; and USAir, which later challenged itself by offering service from its Pittsburgh hub to MDW.

Passengers' Response To Challengers

Prior to the entry of Midway, passengers did not have a choice of airports when they wanted to fly nonstop between Chicago and Pittsburgh because services were only available to and from ORD. The entry of American, the first challenger, in the second quarter of 1984 in the ORD-PIT market could be considered a new service in so far as a new airline was offering a service between ORD and PIT. The service still did not give passengers a chance to fly into or out of the more accessible airport of MDW. Nevertheless, the new service immediately attracted a large number of new OD passengers - 10,000 of them - in the quarter American initiated the service, thereby lending support to the idea that the new service literally ushers new passengers into the market. Patronage of American's service, which amounts to four departures per day each way, could not be explained by frequency alone since American, for the same fare, offered fewer departures than incumbents, United (six) and USAir (nine). Yet, the fact that an airline's entry into the already established ORD-PIT market could stimulate such new air travel is more than miraculous.

A truly different situation occurred when Midway began offering service between MDW and PIT in the first quarter of 1988. With just four departures per day each way as compared to United's six and USAir's seven at ORD, Midway diverted a significant share of passengers (8,000 in first quarter of service) from USAir and United at the more accessible airport, particularly with its special low introductory fare. Perhaps so successful was Midway that USAir responded by inaugurating service between MDW and PIT. Unfortunately, perhaps because of the need for it to compete with its own existing service between ORD and PIT, USAir, by offering a lower frequency of just three departures per day each way at MDW (compared to seven at ORD), could not regain or match the same level of demand for its service at MDW as Midway. Specifically, over the subsequent quarters after the second quarter of 1988, USAir consistently carried

about half as many OD passengers as Midway in the MDW-PIT market. It is also worth noting that the introduction of both services between MDW and PIT may have, in part, affected United adversely, as can be seen by the sharp decline in OD traffic after the first quarter of 1988 (Figure 6.221), whereas USAir seemed to have recovered in the ORD-PIT market. The other plausible cause is that passengers may have shied away from United in favor of services at MDW because United had cut-back on frequency from six to four flights per day each way after the first quarter of 1988. Passengers were, however, loyal to USAir and American's services between ORD and PIT as Figure 6.221 indicates little fluctuation in OD traffic for these carriers after the entry of the challengers at MDW. Thus, one suspects that the various air services appeal to different travelers.

Airlines' Response To Challengers

Airline competition on the basis of frequency was observed when Midway and USAir introduced services between MDW and PIT. Apparently, American's entry in the ORD-PIT market with just three departures per day each way, which is fewer than the number of departures the incumbents (United and USAir) offered, did not create a frantic commotion amongst the incumbents. A check with the load factors (Figure 6.225) for USAir and United revealed that both the incumbents were securing exceptionally high average load factors of between 60% and 70% in the quarters prior to American's entry, particularly because of the large number of non-OD traffic carried on the flights. However, the wide cyclical fluctuations (Figure 6.225) in load factors (40s to 60s) on USAir's services, and the visible decline in non-OD traffic (Figure 6.224) may have prompted USAir to reduce frequency from nine to six per day each way in the first quarter of 1987, after which the airline had decided to maintain seven departure per day each way as OD traffic stabilized over the next few years. It seemed as though USAir had deliberately wanted to have an edge over United in terms of frequency so that it could be the leader in OD traffic share - which it finally attained by the late 80s. With the continuous decline in its non-OD traffic as OD traffic remained relatively stable, USAir did not hesitate to reduce frequency to just six departures per day each way in the early 90s, knowing well that its main rival, United, had also reduced frequency to four departures per day each way by the late 80s. Both United and USAir were then content with achieving load factors that hovered around 60% after all the changes in frequency they had both made.

The entry of Midway and USAir in the MDW-PIT market in early 1988 prompted a matching of frequency amongst American, Midway and USAir. Perhaps

such an observation could be explained by the fact that American, which has a smaller presence than United at ORD, was very concerned with the potential threat of the two challengers at nearby MDW. As it turned out, there was little cause for alarm since American did not lose OD passengers to Midway or USAir (MDW) throughout the years in which service was available between MDW and PIT. In fact, even non-OD traffic was not noticeably diverted from American to the two challengers at MDW (Figure 6.224). Unfortunately, even though the ratio of non-OD is to OD traffic for American was consistently in the vicinity of 2:1, American secured load factors that were between 40% and 60%, which is marginally better than what its rivals at MDW could achieve (30 % to 50%). In fact, USAir could have created a diversion of its own non-OD traffic from ORD to MDW since the sharp increase in non-OD traffic in 1988 was accompanied by a corresponding decline in non-OD traffic in the ORD-PIT market. USAir's non-OD traffic for both parallel markets only stabilized after the first quarter of 1990. Midway was least successful in filling its planes for it secured depressing average load factors that were typically in the 30s. Given that it did not have an extensive route network at MDW, it captured just as many non-OD passengers as OD passengers.

Concluding Remarks

While stimulation of total OD traffic was present each time a challenger entered the Chicago-Pittsburgh market, the market as a whole only grew from 50,000 passengers per quarter to 70,000 passengers per quarter in 10 years (Figure 6.226). In particular, growth began to wane by the late 80s, with the exit of Midway being the signal for a sharp decrease in OD traffic in the second quarter of 1991. However, it is clear that USAir, with its hub at PIT, channeled much of its resources to developing viable services at the two airports in Chicago. It could easily do so since ORD and MDW would simply be considered two separate spokes emanating from its hub at Pittsburgh. By operating to both airports in Chicago, USAir had clearly offered its passengers a choice, and was subsequently able to capture more OD passengers than its rivals, all of which only offered service between PIT and one of the airports in Chicago. In the final analysis, although services were available at both MDW and ORD, the overwhelming majority chose to fly to or from ORD, the airport which offered more flights per day to and from Pittsburgh. This, however, does not displace the notion that the secondary airport does not have a role at all; instead, one could speculate how much diversion there could be if frequency of service between MDW and PIT were increased to the level of that between ORD and PIT. In the absence of equal service at both airports, one could see that

passengers would still have a propensity to go to the airport that offers more flights, regardless of accessibility.

Figure 6.221 Chicago-Pittsburgh: Smoothed Quarterly OD Traffic

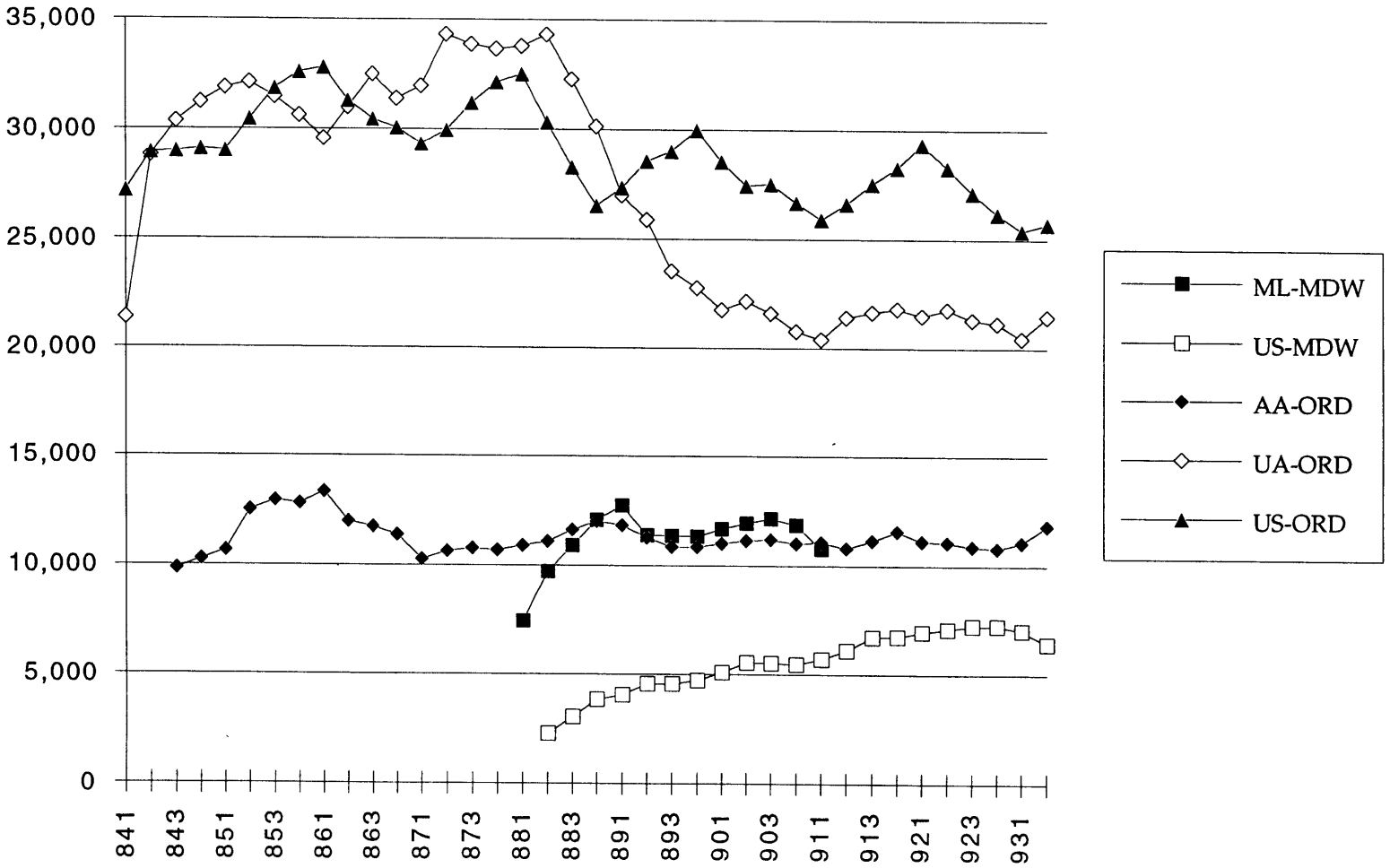


Figure 6.222 Chicago-Pittsburgh: Average One-Way Fare ($)

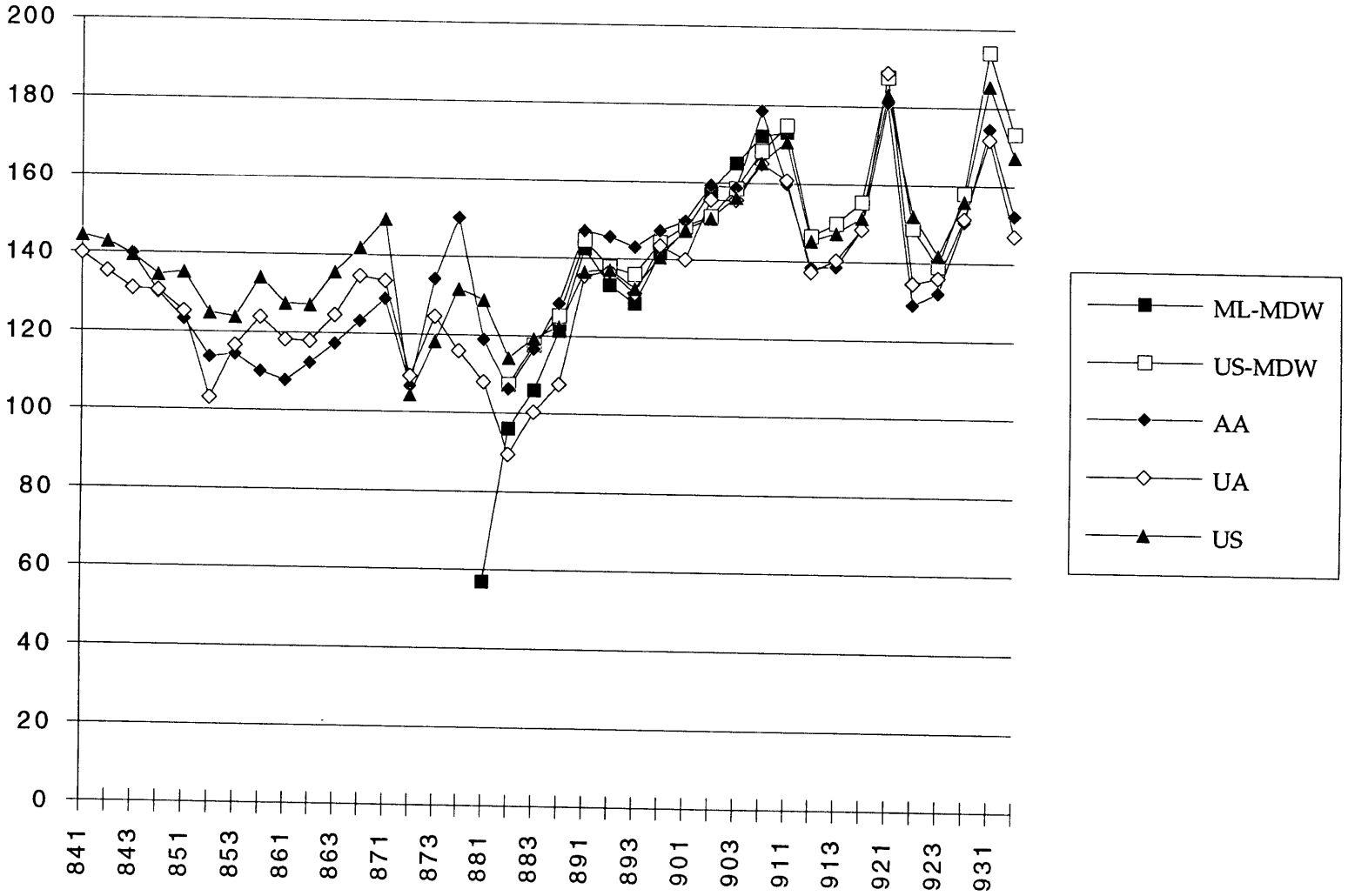


Figure 6.223 Chicago-Pittsburgh: Average Number Of Departures Per Day Each Way

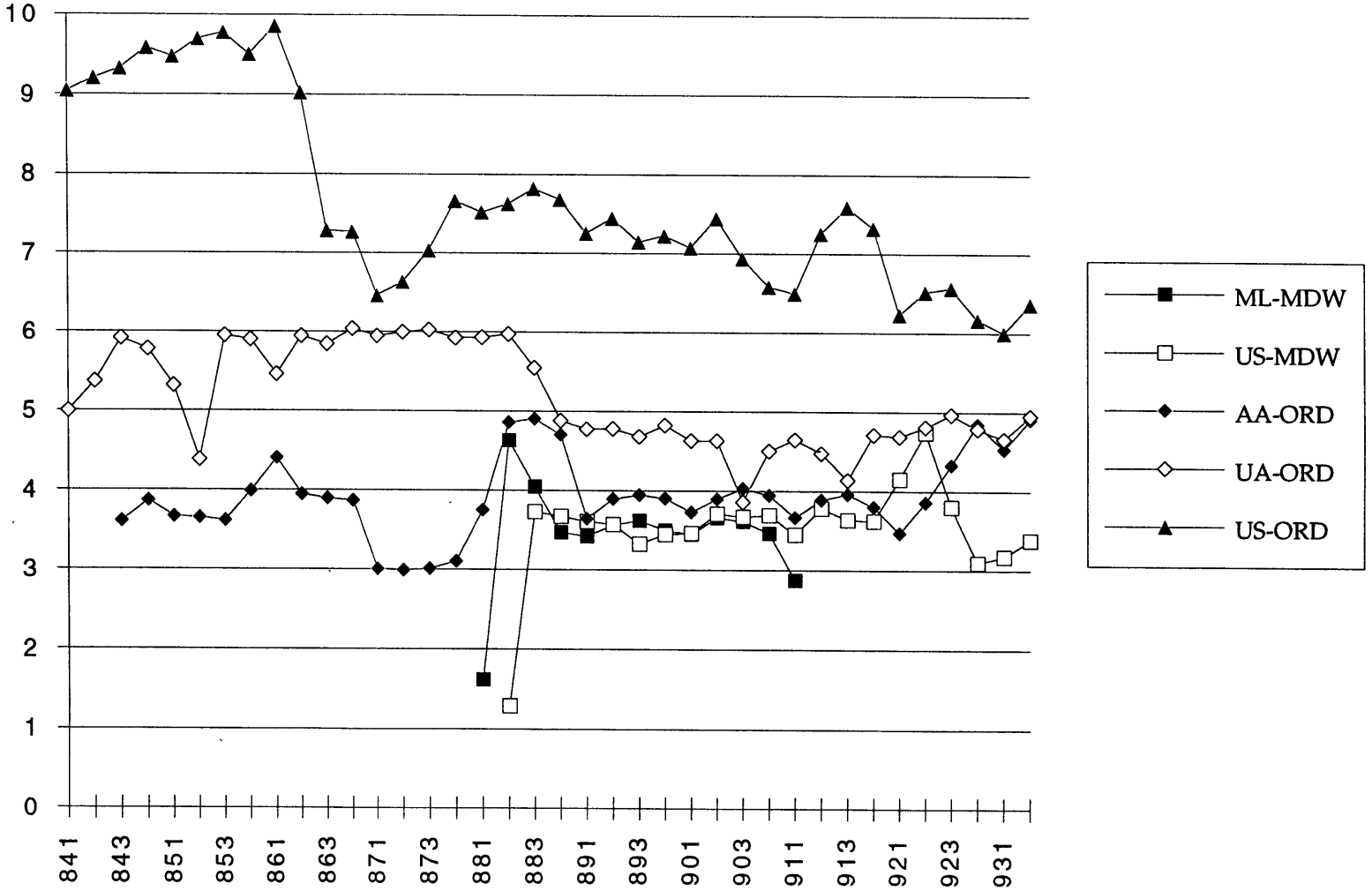


Figure 6.224 Chicago-Pittsburgh: Smoothed Quarterly Non-OD Traffic

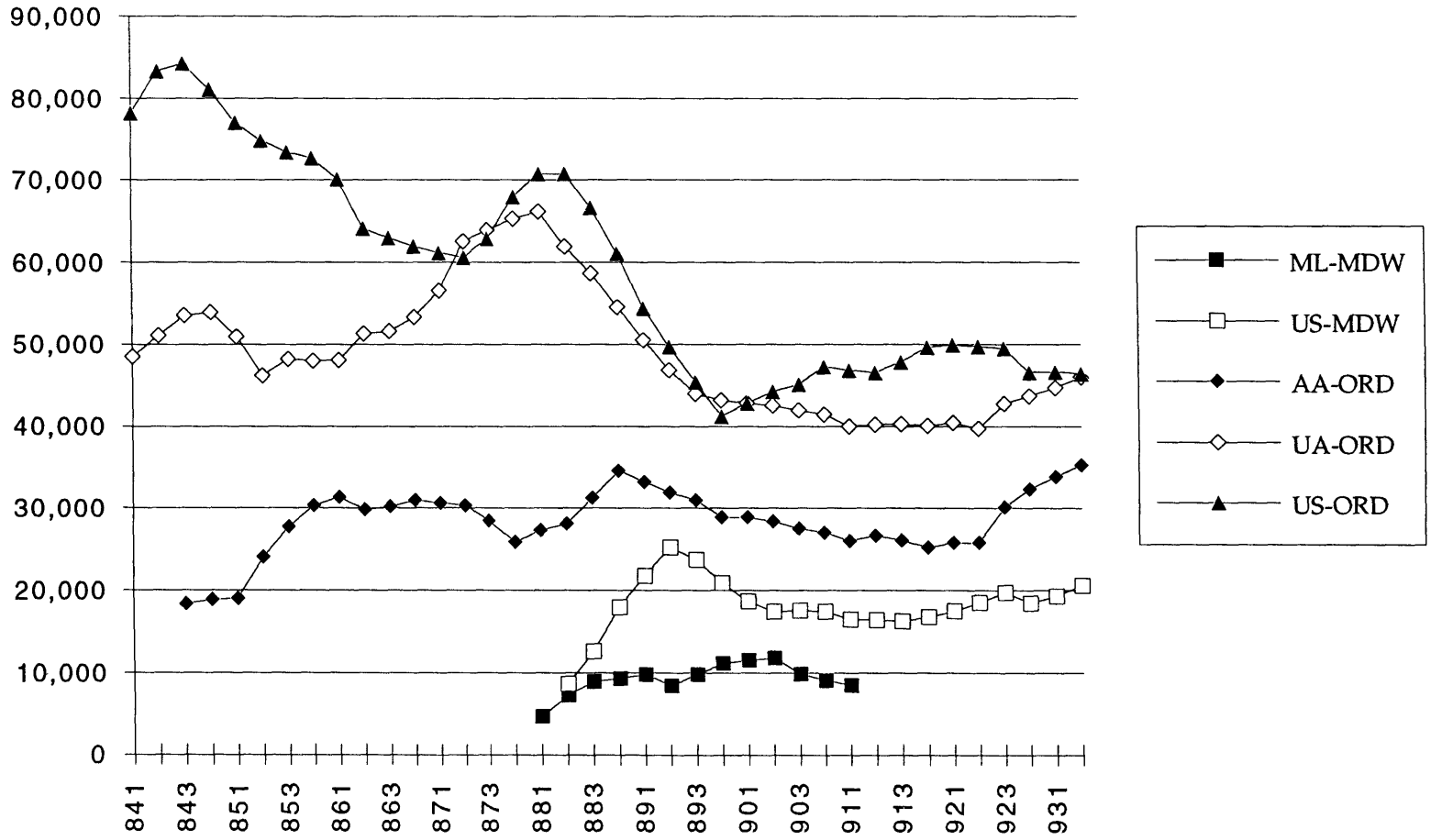


Figure 6.225 Chicago-Pittsburgh: Average Quarterly Load Factor (%)

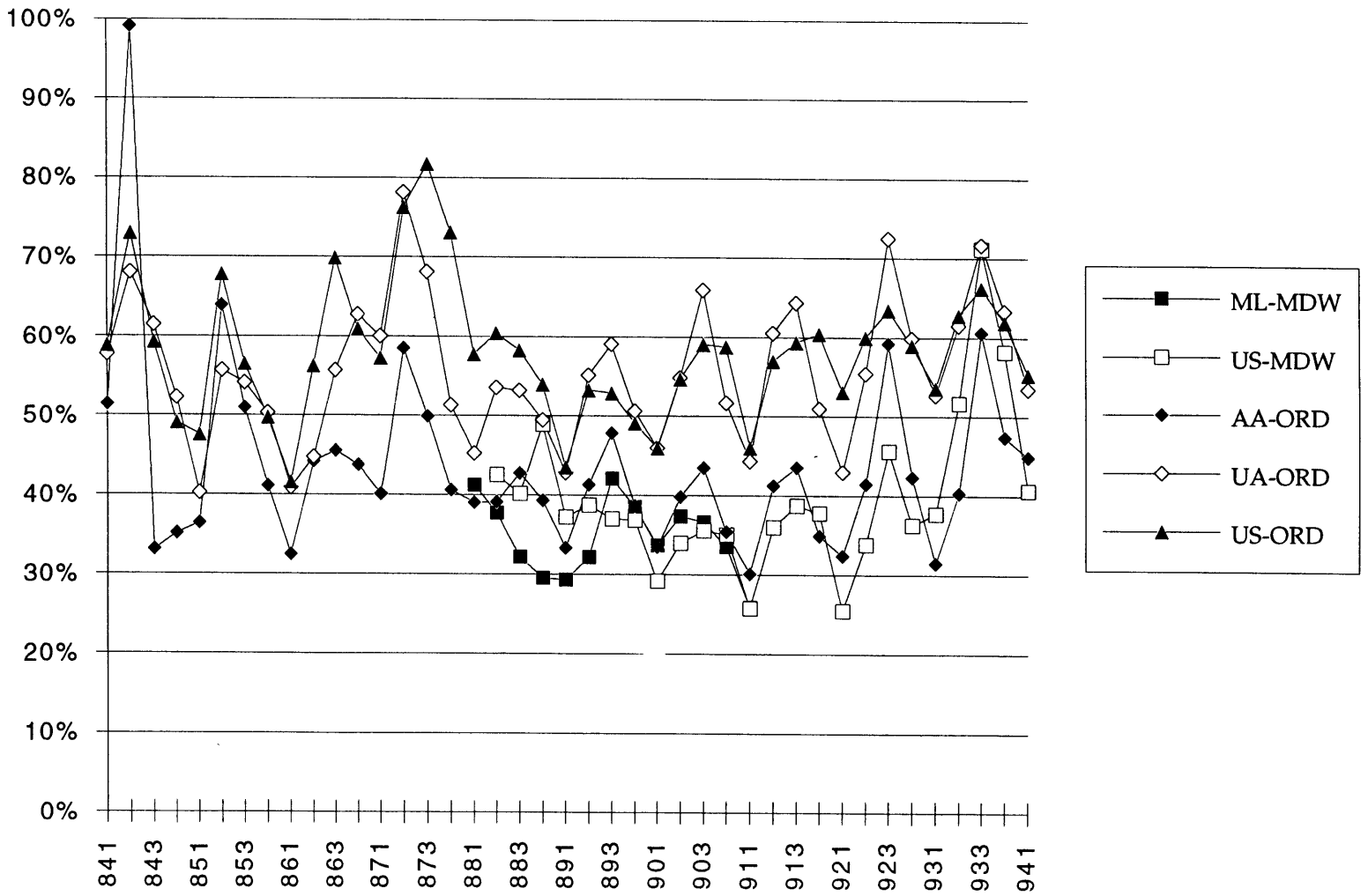
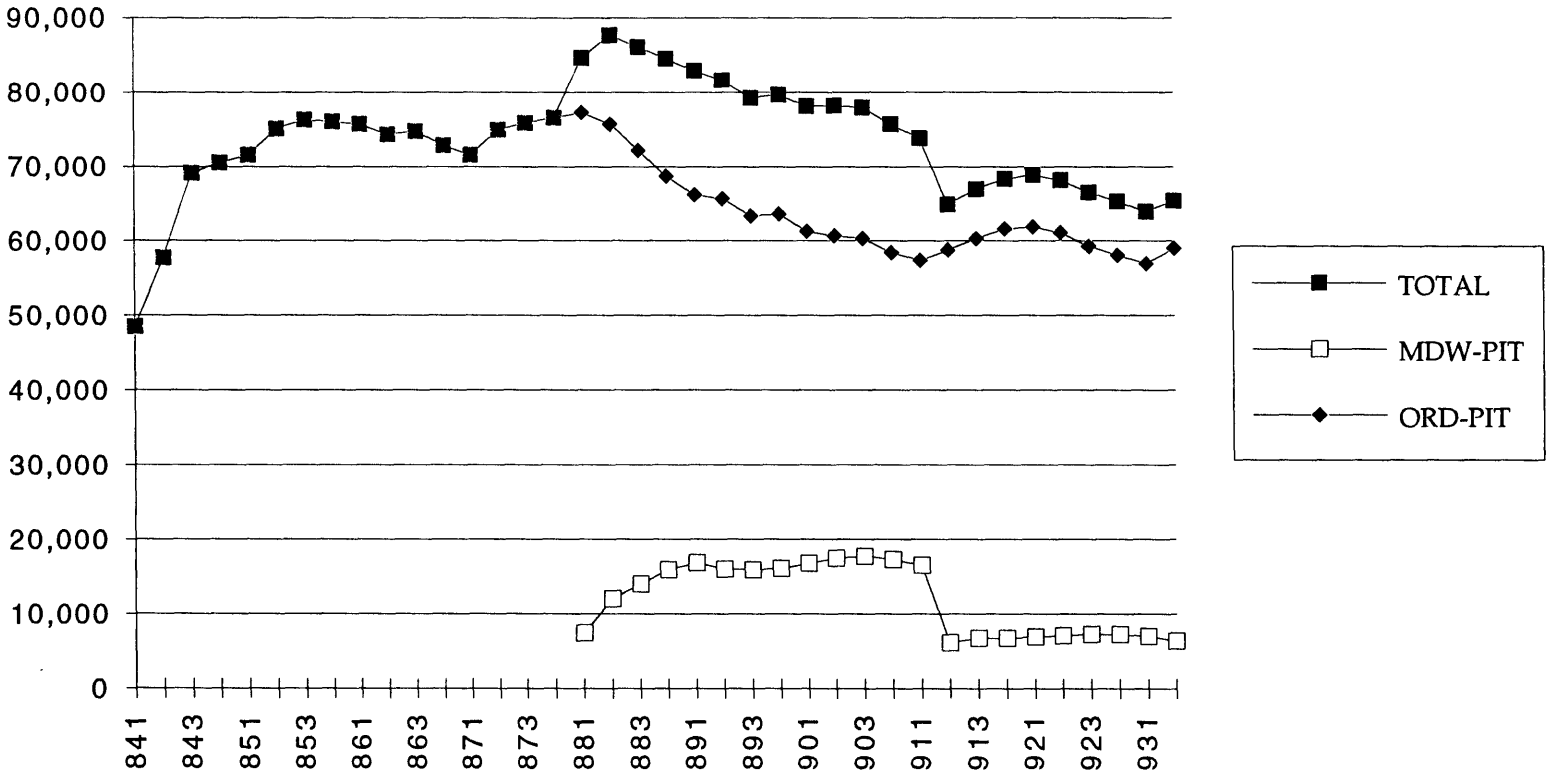


Figure 6.226 Chicago-Pittsburgh: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.23 Scenario 2: Houston-Memphis (HOU/IAH-MEM, Distance = 486 miles)

Preliminary Remarks

The competitive dynamics in the Houston-Memphis market seem lackluster for the reason that with the exit of Delta from the nonstop market in the fourth quarter of 1986, Northwest was the only airline that served Memphis from both HOU and IAH for a few years, after which it decided to abandon services between MEM and IAH altogether. Thus, in the quarters after the third quarter of 1991, Northwest enjoyed a distinct monopoly on services between HOU and its hub at Memphis. This case should illustrate how air travelers respond to a transfer of air service from one airport to another, and how Northwest challenged itself by inaugurating services at IAH despite already establishing itself in the HOU-MEM market.

Passengers' Response To Challengers

Prior to the third quarter of 1985, services between Memphis and Houston were available from both HOU and IAH, with Delta operating between IAH and MEM, and Republic, between HOU and MEM. Delta secured the larger share of the OD traffic between Houston and Memphis even though it offered services to and from the less accessible airport at a lower frequency than Republic. Then, by boosting frequency from three to four flights per day each way by the first quarter of 1985, Delta achieved further gains in its already superior OD traffic share until the third quarter of 1985. In the quarters before the third quarter of 1985, Republic's service between HOU and MEM was clearly less popular whether it matched Delta's frequency of service at IAH or otherwise. Since the average fares were similar (Figure 6.232), it is not immediately obvious why OD passengers showed a very distinct preference for Delta's services to and from the less accessible airport in Houston. However, by initiating a self-challenge at IAH, Republic, in the third quarter of 1985, did not really stimulate demand instantaneously. In fact, by offering one departure less than that at HOU, OD traffic between IAH and MEM grew very quickly only after the first quarter of operations. Of interest is the observation that passengers may have switched from Delta to Republic because OD passenger boarding at Delta declined at the same time Republic achieved increases in OD traffic for its services between HOU and IAH and MEM (Figure 6.231). Nevertheless, the transfer of OD traffic was not complete because Figure 6.236 revealed a sudden decrease in OD traffic in the quarter after Delta's exit, thereby indicating the disappearance of a large number of air travelers with the loss of air service that was once provided by Delta. Yet, OD traffic in the IAH-MEM market never did reach its

former glory after Northwest 'took over' Delta's operations between IAH and MEM. Specifically, the size of the OD traffic in the IAH-MEM market under the reign of Northwest was only less than half of that when Delta was serving the same market. Even with the equalizing of flight departures in both the HOU-MEM and IAH-MEM markets in the first quarter of 1988, the huge disparity in OD traffic share between the two markets was maintained (Figure 6.231) until Northwest discontinued services between IAH and MEM in the third quarter of 1991. In short, given the choice of two airports and a similar frequency offered by the same airline at both HOU and IAH, passengers flocked to the more accessible airport in Houston (HOU). Left with little choice after the disappearance of nonstop service between IAH and MEM after the third quarter of 1991, passengers who would otherwise have gone to IAH may have gradually switched to HOU, as can be seen by the sharp rise in OD traffic for the HOU-MEM market in the 90s (Figure 6.231).

Airlines' Response To Challengers

Having "solidly anchored and buttressed" [50] itself in Memphis, Northwest was clearly challenging itself with flights between IAH and MEM as a means of providing more service between Houston and Memphis to suit the needs of air travelers who may prefer IAH over HOU. It could easily justify duplicating the service at IAH because it had a sizable hub operation at Memphis which could provide the necessary feed. Indeed, non-OD traffic far exceeded the OD traffic (Figure 6.234) in both HOU-MEM and IAH-MEM markets; this in-turn allowed Northwest to attain load factors that were, for the most part, in excess of 50%. However, it seemed odd that Northwest withdrew service between IAH and MEM when load factors were still above 50% even though it had reduced frequency by one departure in each direction. One plausible reason is the declining number of non-OD passengers on flights between IAH and MEM, as can be seen by the bow-shaped curve in Figure 6.236.

Concluding Remarks

Stimulation effects were not present in the Houston-Memphis market when Northwest introduced service between IAH and MEM. In essence, Northwest's service was a replacement for a service which would otherwise be lost because of Delta's exit. Average fares remained stable since Northwest was not offering a different fare to those flying between IAH and MEM. In this monopoly market, total OD traffic decreased from 18,000 per quarter to around 10,000 per quarter after the exit of Delta. However, since the study only examined the nonstop market, one could not be certain if some of the

passengers had decided to travel on other carriers that offered an alternative routing. If one believes in the notion that more service stimulates traffic, as has been observed in many of the previous cases, then one could postulate that the lack of service between Houston and Memphis may be a contributing factor to the overall decline in OD traffic observed. However, the Houston oil-based economy may have also caused the overall decline in OD traffic between the two cities. Regardless, the Houston-Memphis market highlights the behavior of passengers when faced with the introduction and the subsequent withdrawal of service from one of the airports in the multiple airport system. In this case, one may conclude that the loss of air service at one of the airports in the dual-airport system resulted in a momentary loss of traffic.

Figure 6.231 Houston-Memphis: Smoothed Quarterly OD Traffic

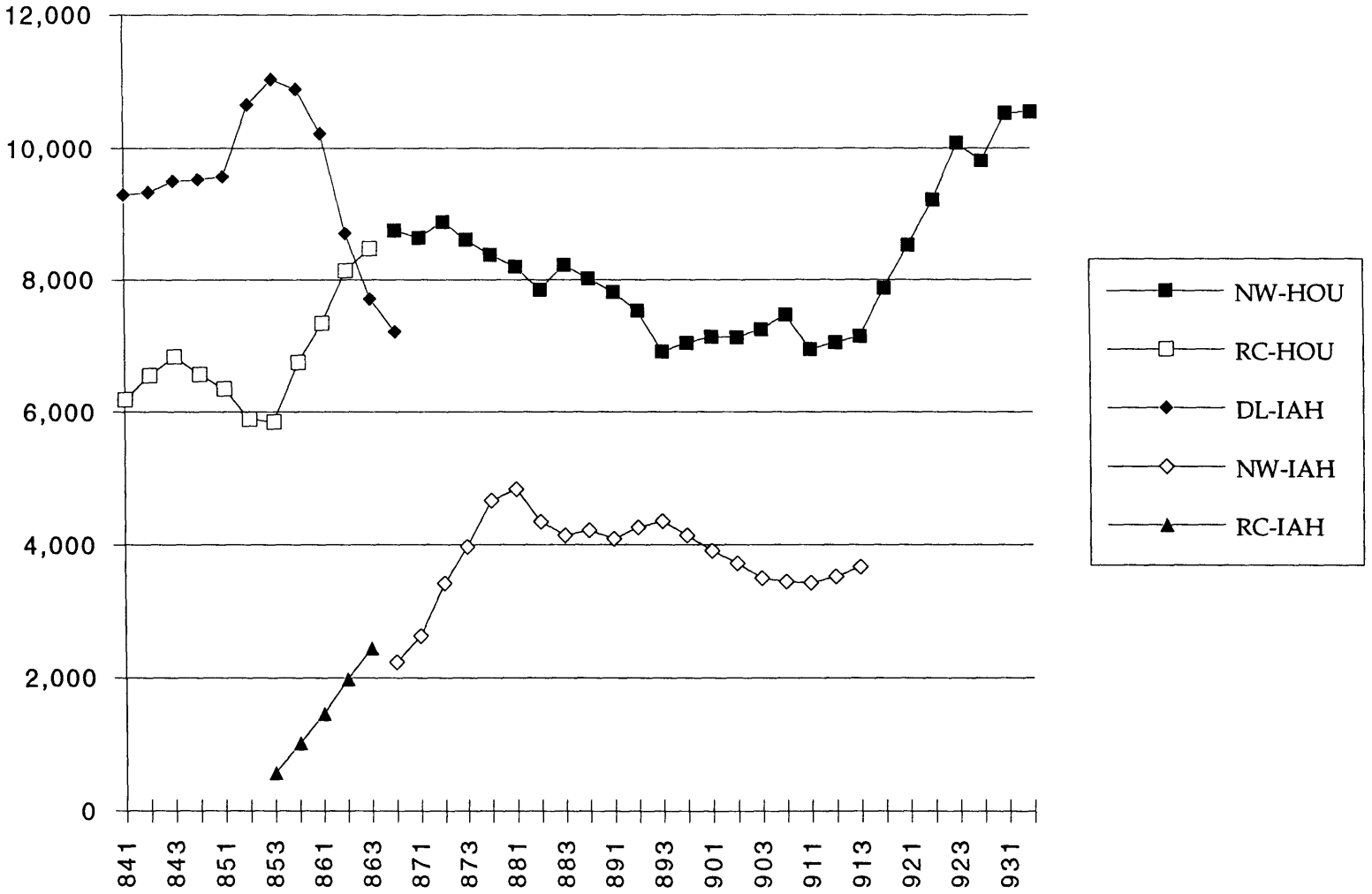


Figure 6.232 Houston-Memphis: Average One-Way Fare ($)

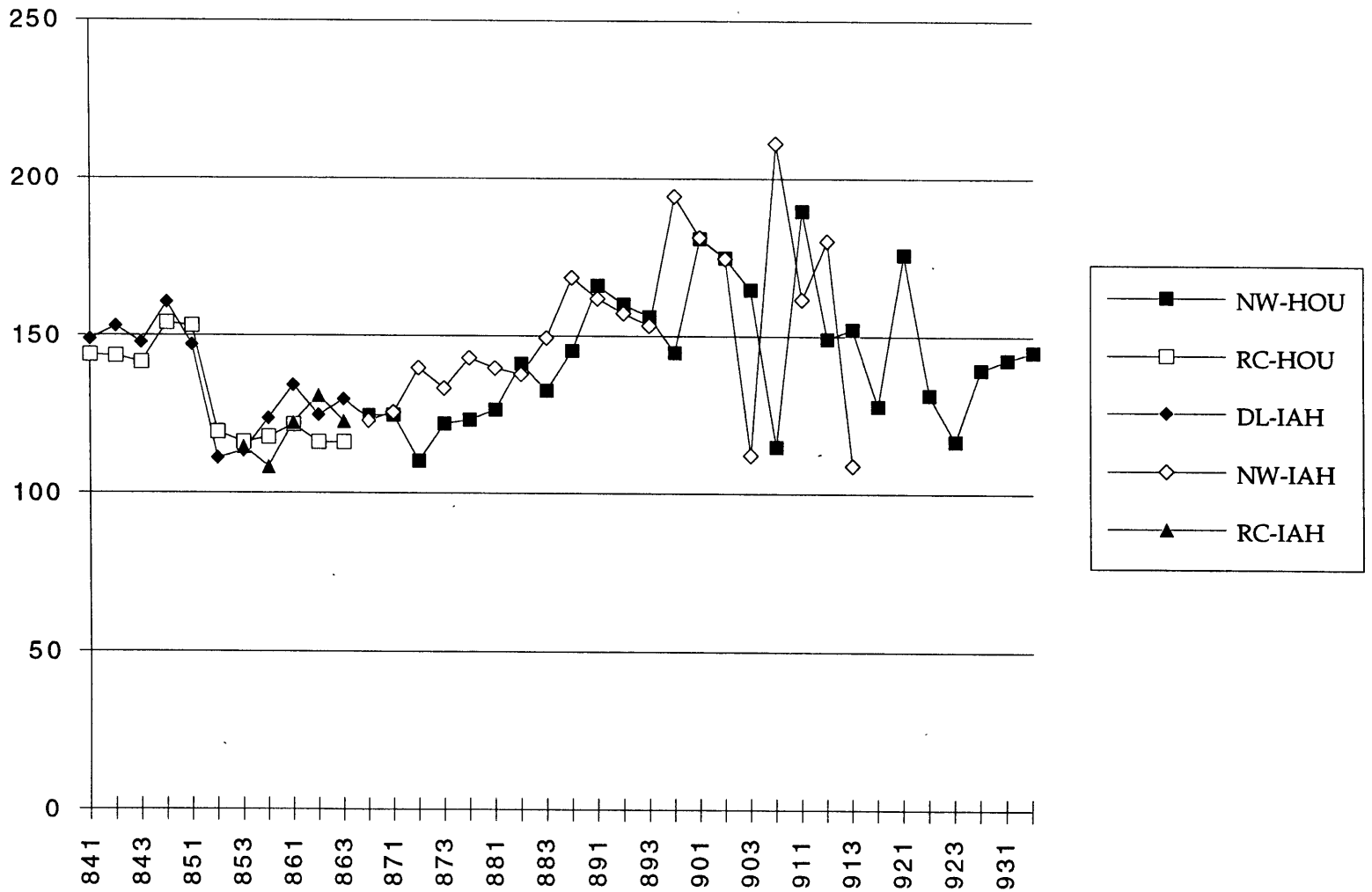


Figure 6.233 Houston-Memphis: Average Number Of Departures Per Day Each Way

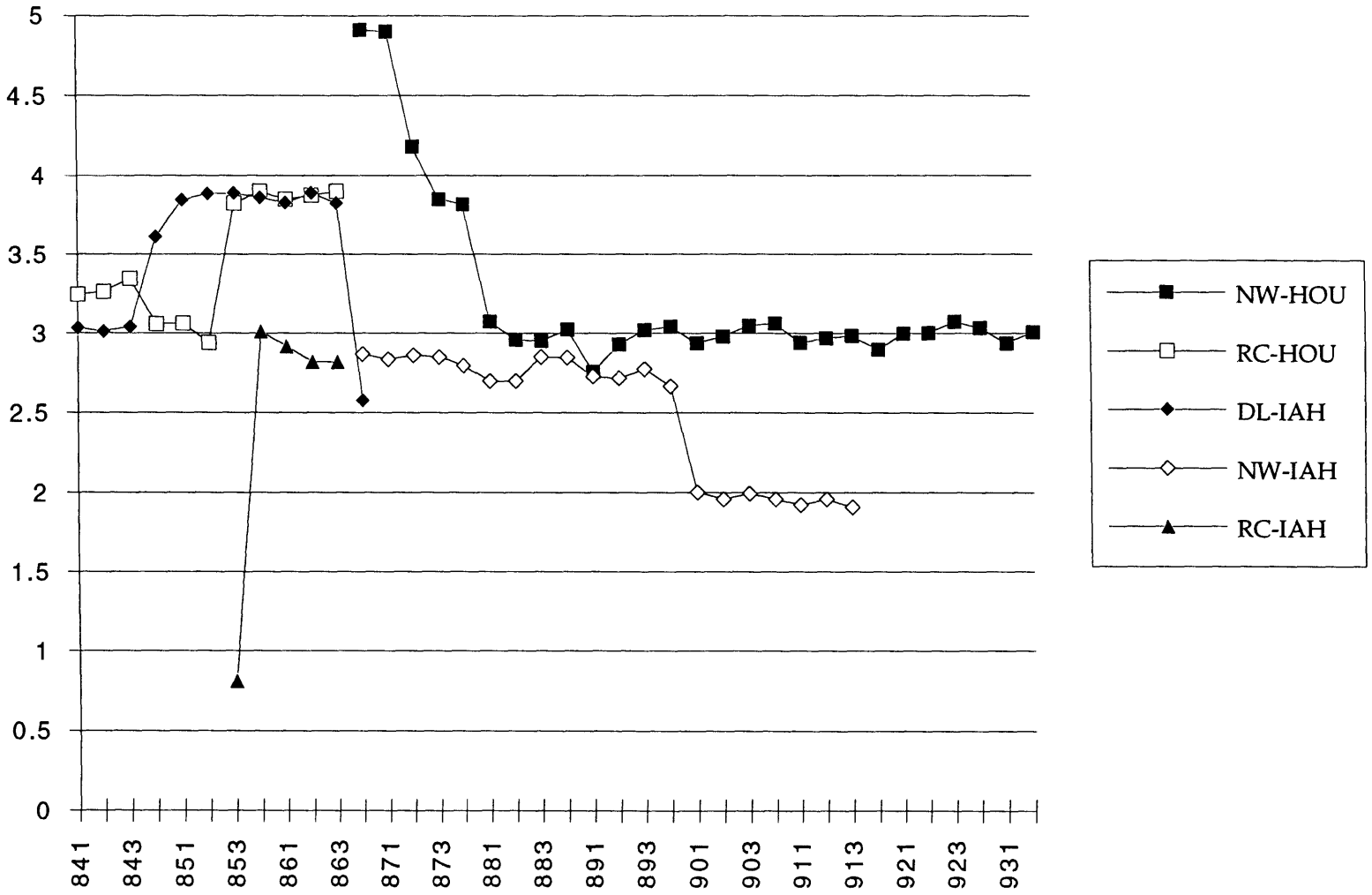


Figure 6.234 Houston-Memphis: Smoothed Quarterly Non-OD Traffic

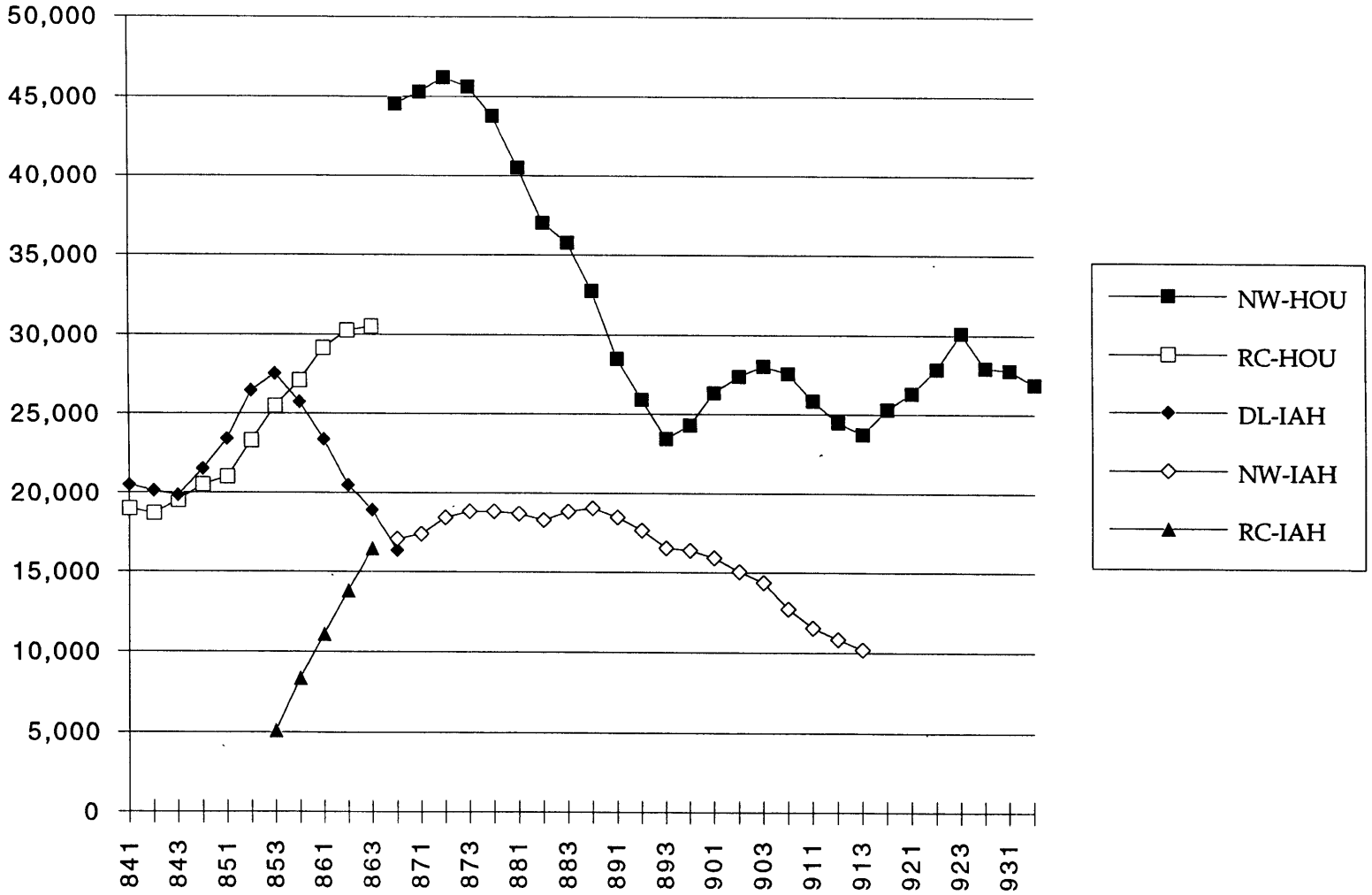


Figure 6.235 Houston-Memphis: Average Quarterly Load Factor (%)

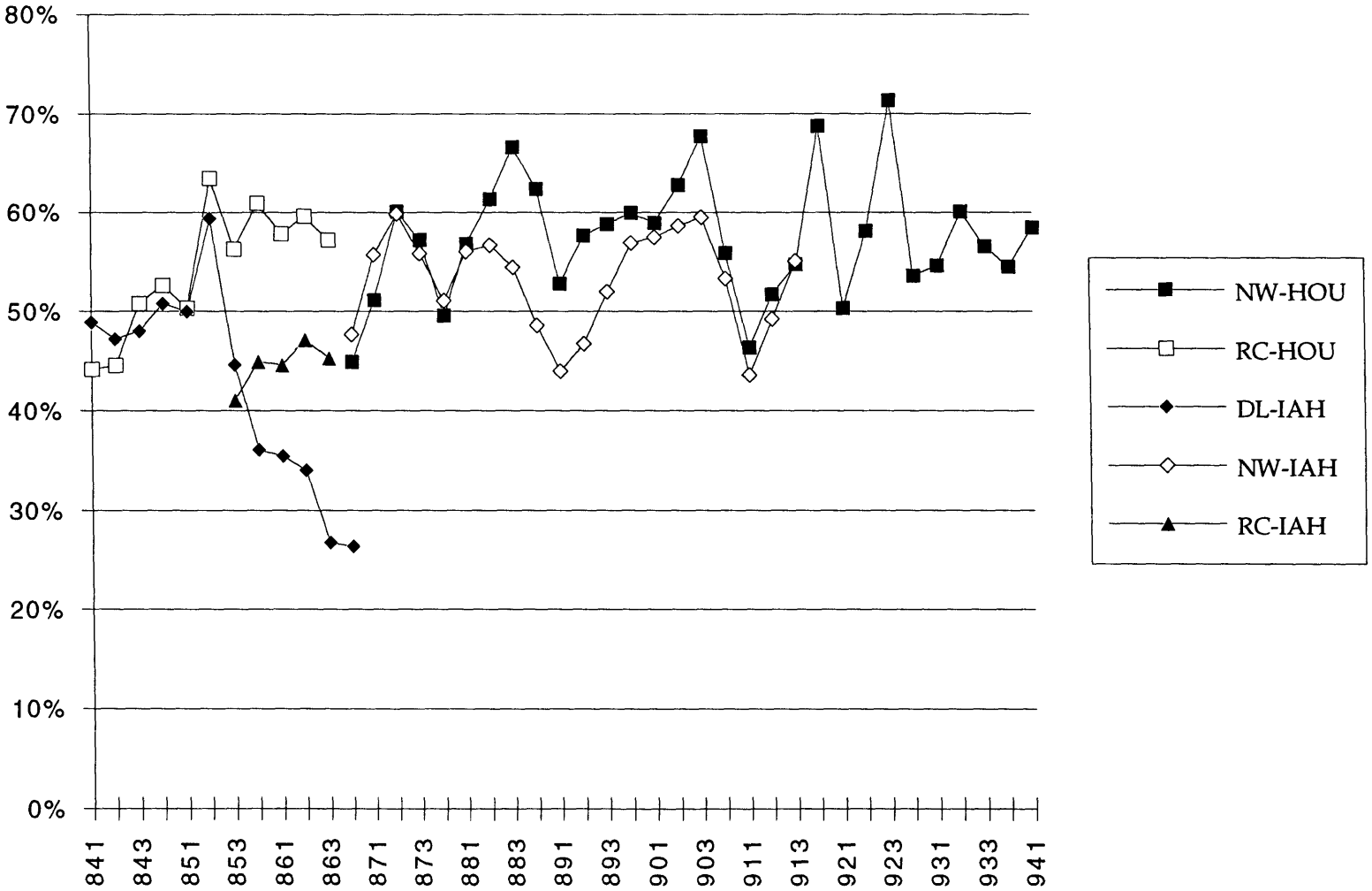
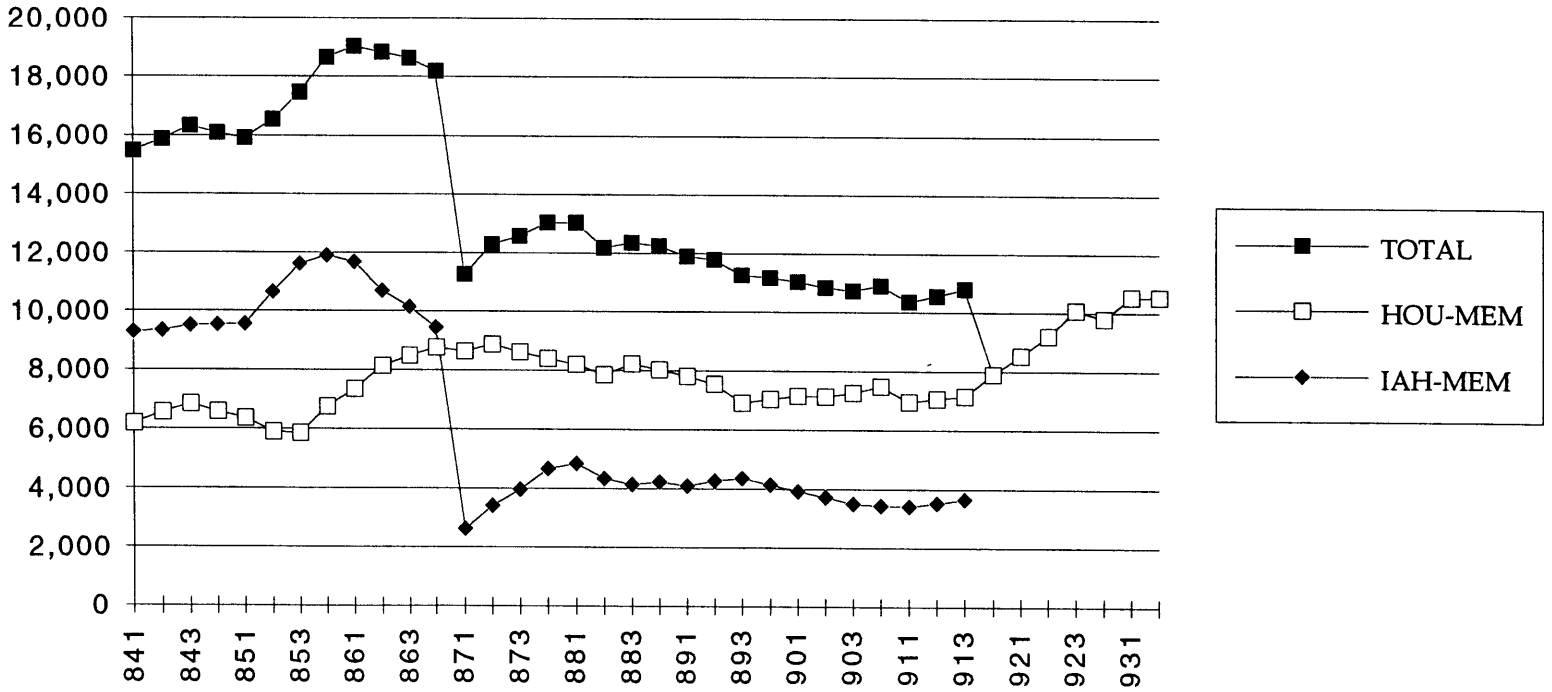


Figure 6.236 Houston-Memphis: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.24 Scenario 2: Houston-St. Louis (HOU/IAH-STL, Distance = 684 miles)

Preliminary Remarks

As one can see from the number of intersections in Figure 6.241, competition in the Houston-St. Louis market was fierce, with Southwest clearly leading the way after the second quarter of 1989. Despite the growth in the market as a whole, only two challengers appeared: Southwest challenged TWA in the HOU-STL market while Continental, which has a hub a IAH, challenged TWA in the IAH-STL market. The most significant observation is the way Southwest 'grew' the market with its low fares and high frequency of service between HOU and STL.

Passengers' Response To Challengers

Before the entry of Southwest, passengers preferred Ozark's service between HOU and STL over TWA's between IAH and STL for the same number of departures (three) and similar fares. While one may infer that passengers found HOU more accessible than IAH, this inference could be confounded by the fact that Ozark did set itself apart from TWA by offering a distinct inflight service. In particular, Ozark pampered its passengers with its "Wine Cellar in the Sky" program whereby passengers could sample a huge selection of domestic and imported wines, and choose meals from an exotic menu [51]. The irony is that Ozark was offering the premium inflight service in a densely packed one-class cabin. However, the entry of Southwest in the HOU-STL market with its low fares did lower the average fare from $130 to $60, thereby stimulating travel as Southwest captured a handsome 8,000 passengers in the first quarter of 1985. Although passengers may have patronized Southwest for its low fares and that the flights were available at the more accessible airport of HOU, it is unclear as to whether passengers chose Southwest because of frequency since Southwest was not aggressive in the early part of its reign. Prior to 1988, Southwest offered fewer departures than Ozark or TWA at HOU although fares were kept low at less than $100. Thus, Southwest was not the leader in market share of OD traffic until 1989, when it switched gears to offer more departures than its rivals at HOU and IAH. Nevertheless, the entry of Southwest may have affected Ozark since Southwest's gain in OD traffic in the four quarters after the launch of its service was accompanied by a corresponding loss in OD traffic for Ozark within the same period. Despite offering slightly higher fares, TWA's service between IAH and STL had also became increasingly popular in 1985 and 1986. In fact, with the merger of Ozark and TWA in 1986, there was an unusual 'cross-over' in the OD traffic curves for TWA's HOU and IAH operations in late

1986, perhaps because of the addition of one departure in the IAH-STL market. At this time, Southwest had lost the race because it offered fewer departures than TWA at HOU.

However, the entry of the second challenger, Continental, at IAH did change the competitive profile quite radically. With only two departures per day each way compared to TWA's three, Continental's entry was successful because it did stimulate 5,000 passengers immediately (Figure 6.241), perhaps because it offered lower fares (Figure 6.242) than other airlines in the Houston-St. Louis market. Even with its higher frequency, TWA (IAH) might have been affected by Continental's entry since the converging curves in Figure 6.241 might indicate that Continental may have gained some OD passengers at the expense of TWA (IAH). However, another reason for TWA's (IAH) loss is the increasing popularity of TWA and Southwest's services between HOU and STL.

In particular, Continental's entry may have triggered Southwest to increase frequency to capture a larger share of the OD traffic between the two cities. Indeed, between the second quarter of 1987 and the second quarter of 1989, Southwest trebled the number of departures from two to six, an aggressive effort that paid-off as OD traffic climbed from just 12,000 per quarter to 25,000 per quarter within two years, thereby making Southwest the leader in market share by the second quarter of 1989. In a similar vein but on a smaller scale, TWA was able to attract more passengers to fly between HOU and STL by adding one departure in each direction, a strategy that brought TWA on par with Southwest in terms of OD traffic size by the second quarter of 1989. With a minimal differential in average fares, one could speculate that passengers were most probably choosing on the basis of frequency and accessibility.

The unusual thing about the Houston-St. Louis market is that with the discontinuation of TWA's service between IAH and STL, passengers were not scrambling for TWA's flights at HOU, as can be seen by the decrease in OD traffic in TWA's HOU-STL market after TWA discontinued services between IAH and STL. On the other hand, it is highly likely that some of the passengers who preferred IAH may have switched to Continental since Continental was, by then, the only airline offering service between IAH and STL. Otherwise, passengers in the HOU-STL pool may have been lured away by Southwest's offer of six -then later, eight - departures per day as compared to TWA's (HOU) four flights per day, and its lower fares. By the end of the second quarter of 1993, it was clear that passengers were captivated by Southwest's services between HOU and STL, while, surprisingly, Continental's service between IAH

and STL attracted slightly more passengers than TWA's service between HOU and STL even though it offered fewer departures.

Airlines' Response To Challengers

A glance at Figure 6.243 revealed that the two incumbents of Ozark and TWA (IAH) did not respond to Southwest's entry in early 1985, while the entry of Continental in the IAH-STL market may have instigated Southwest to boost frequency so that it could be the overall leader in market share. Indeed, Ozark, TWA and Continental did not have to alter their frequency of service drastically because the three airlines secured average load factors that were above 50% regardless of the variation of the mix of OD and non-OD passengers. In fact, Figure 6.244 shows that none of the airlines had difficulty securing a sizable number of non-OD passengers to help fill-up the seats on the aircraft. Besides, TWA had a strong hub at St. Louis that could bring passengers from other destinations in its network to either IAH or HOU. Prior to 1988, non-OD passengers flying TWA showed a distinct preference for service to and from IAH, but with the termination of TWA's services between IAH and STL, non-OD traffic on TWA's flights between HOU and STL soared, particularly after 1991. Continental, on the other hand, had to nurture the non-OD traffic from virtually a trickle to as many as 40,000 passengers by the second quarter of 1993, perhaps because it could basically only tap the feed to and from southern Texas. Even Ozark, which made the right decision to move its base from congested O'Hare to Lambert in the late 70s, was able to expand beyond Missouri's neighbors to the East Coast cities of New York, Philadelphia, Baltimore, and Washington D.C. [51]. As for Southwest, its intra-Texas services to and from HOU would help support the HOU-STL flights, while its increased presence in STL since the early 90s would be responsible for the sharp increase in non-OD traffic in the 90s.

Concluding Remarks

Figure 6.246 indicates that growth in the market is evident as can be seen by the jump in total OD-traffic from just over 35,000 passengers per quarter in early 1984 to 70,000 per quarter by 1993, with Southwest being the largest contributor to the increase. In short, the entry of the two challengers at the two different airports in the Houston area have perhaps brought about a healthy growth in the market as a whole, with stimulation of OD traffic being present during each challenger's entry. A sudden loss of OD traffic was also observed in the fourth quarter of 1989, the quarter when TWA discontinued service between IAH and STL. However, the fact that Southwest had been

instrumental in defining the fare floor implies that passengers did benefit from the entry of Southwest because average fares fell from a high of around $120 in 1984 to around $90 by 1993. The final comment is that Southwest, which does not really have extensive hub operations at HOU or STL, dominated the market, with TWA and Continental taking the back-seat even though both have strong hubs at STL and IAH respectively. Needless to say, with more flights at HOU, most of which were provided by Southwest, more OD passengers chose to fly into and out of HOU.

Figure 6.241 Houston-St. Louis: Smoothed Quarterly OD Traffic

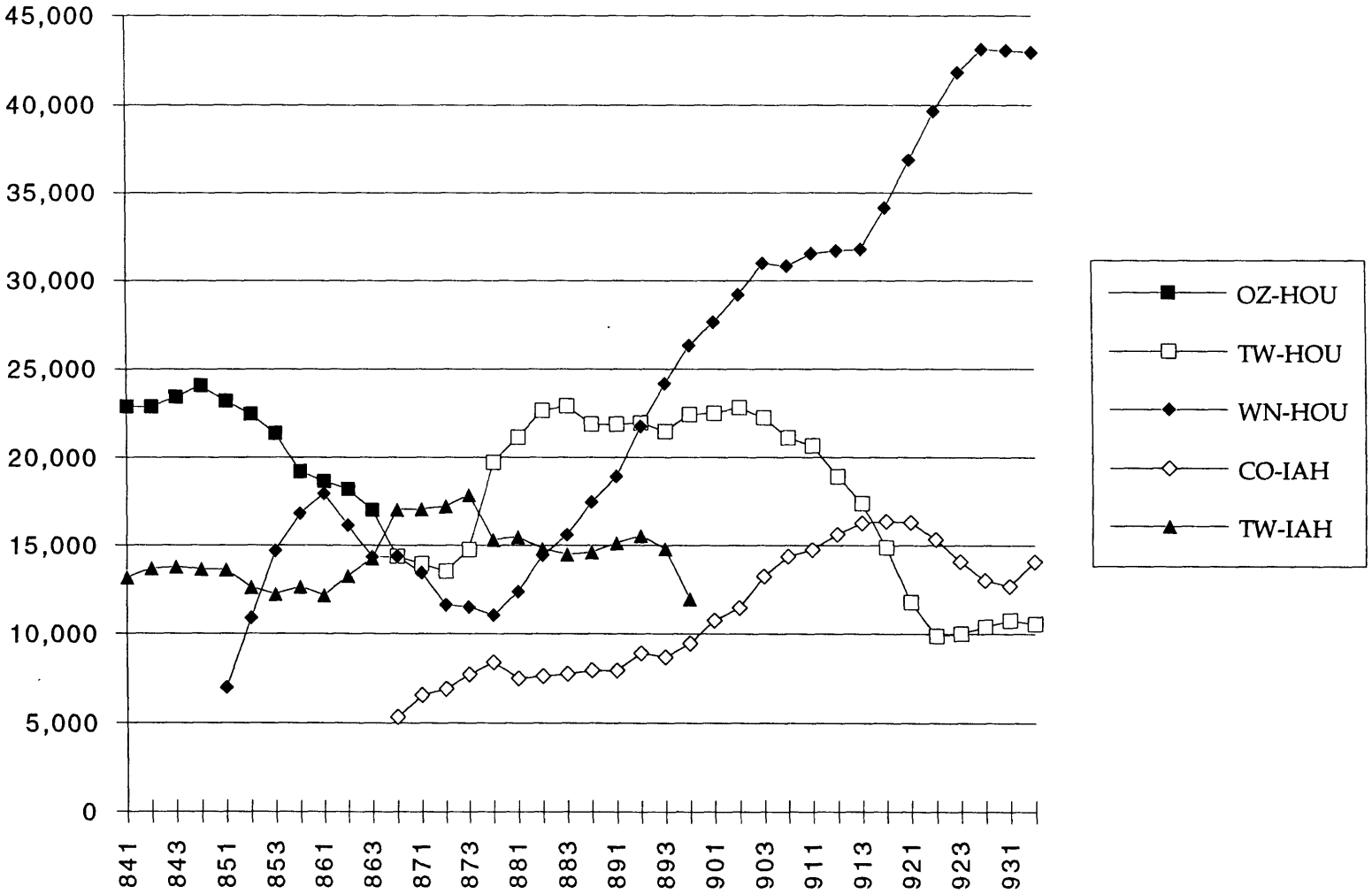


Figure 6.242 Houston-St. Louis: Average One-Way Fare ($)

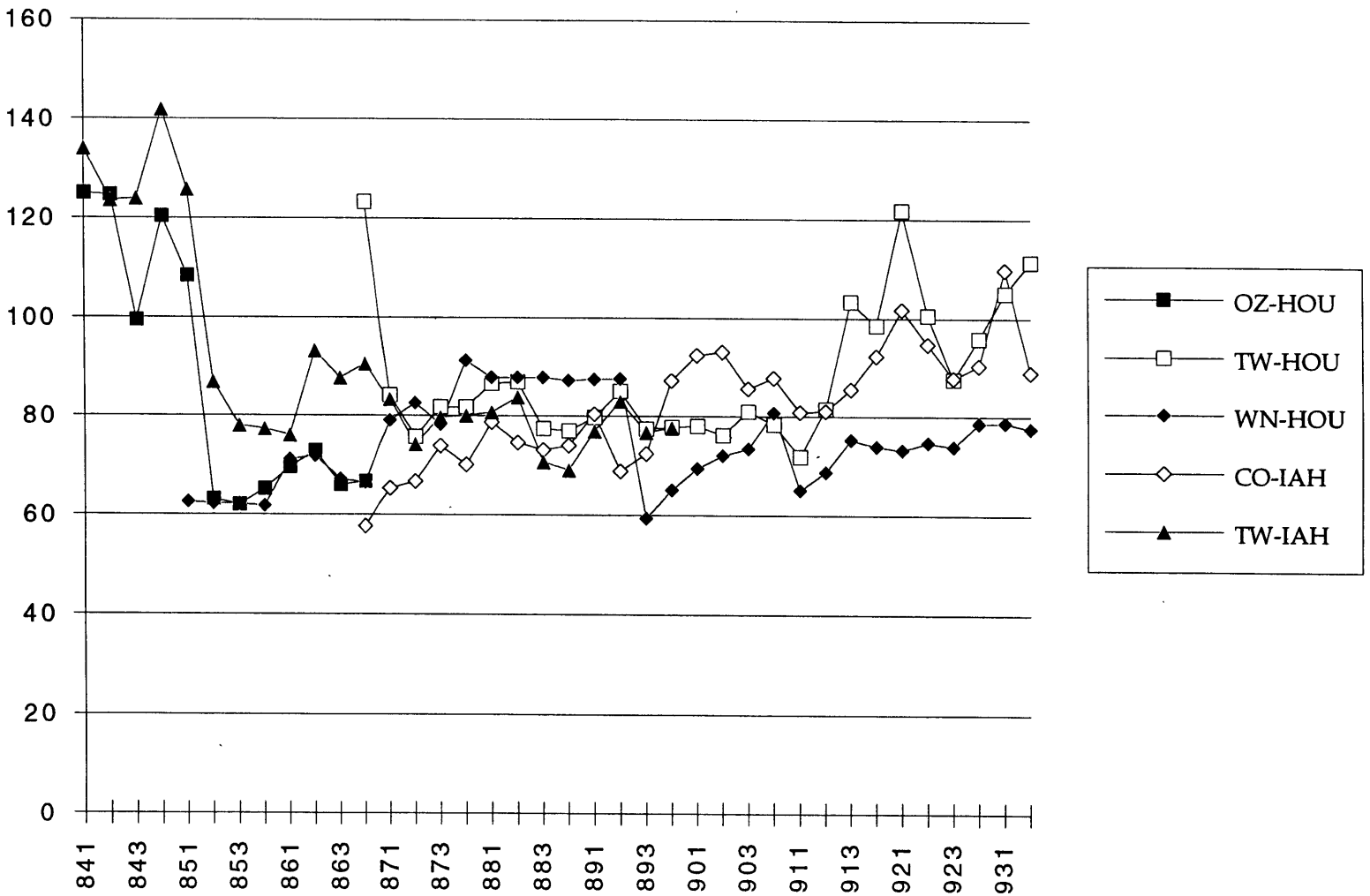


Figure 6.243 Houston-St. Louis: Average Number Of Departures Per Day Each Way

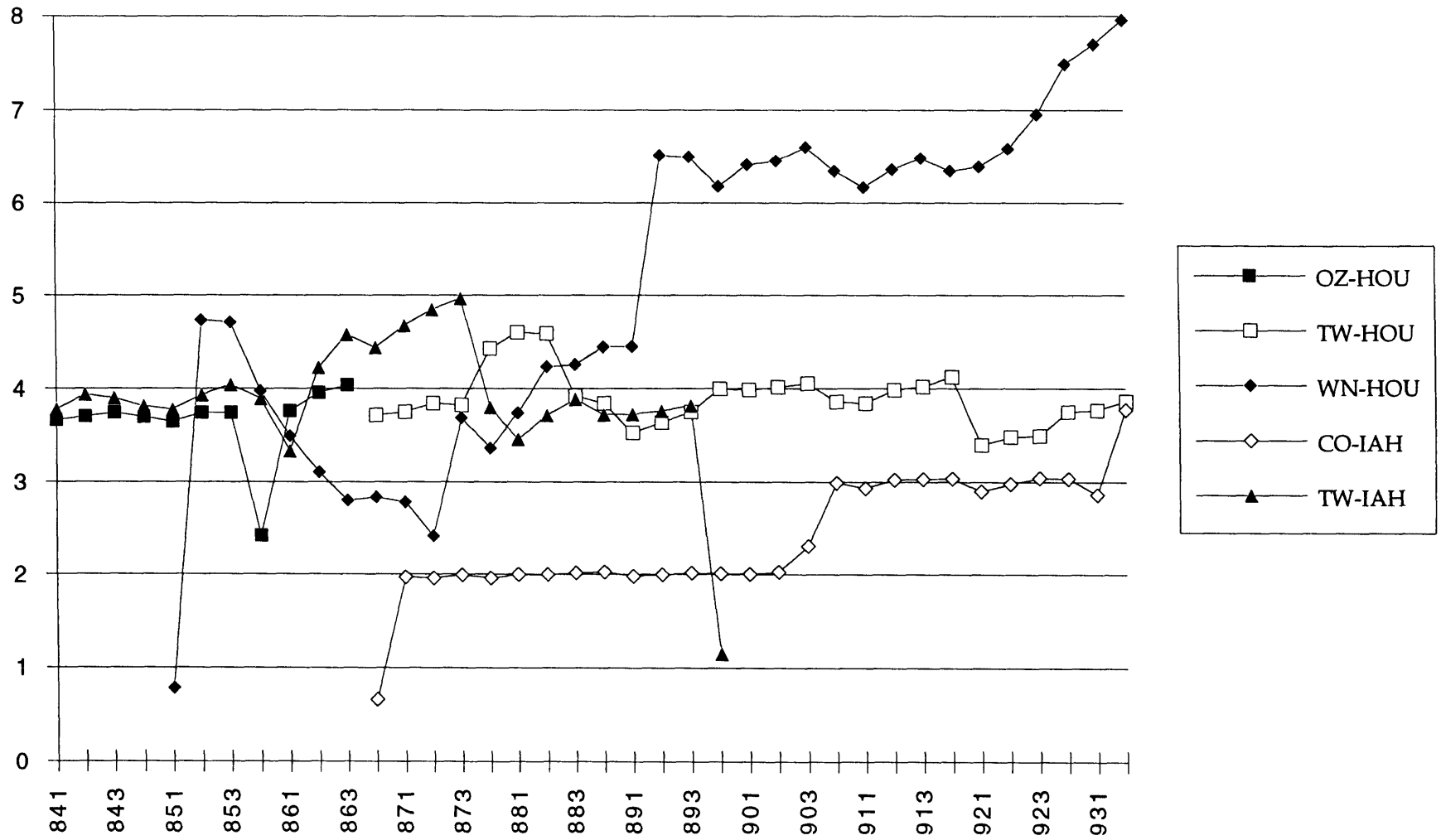


Figure 6.244 Houston-St. Louis: Smoothed Quarterly Non-OD Traffic

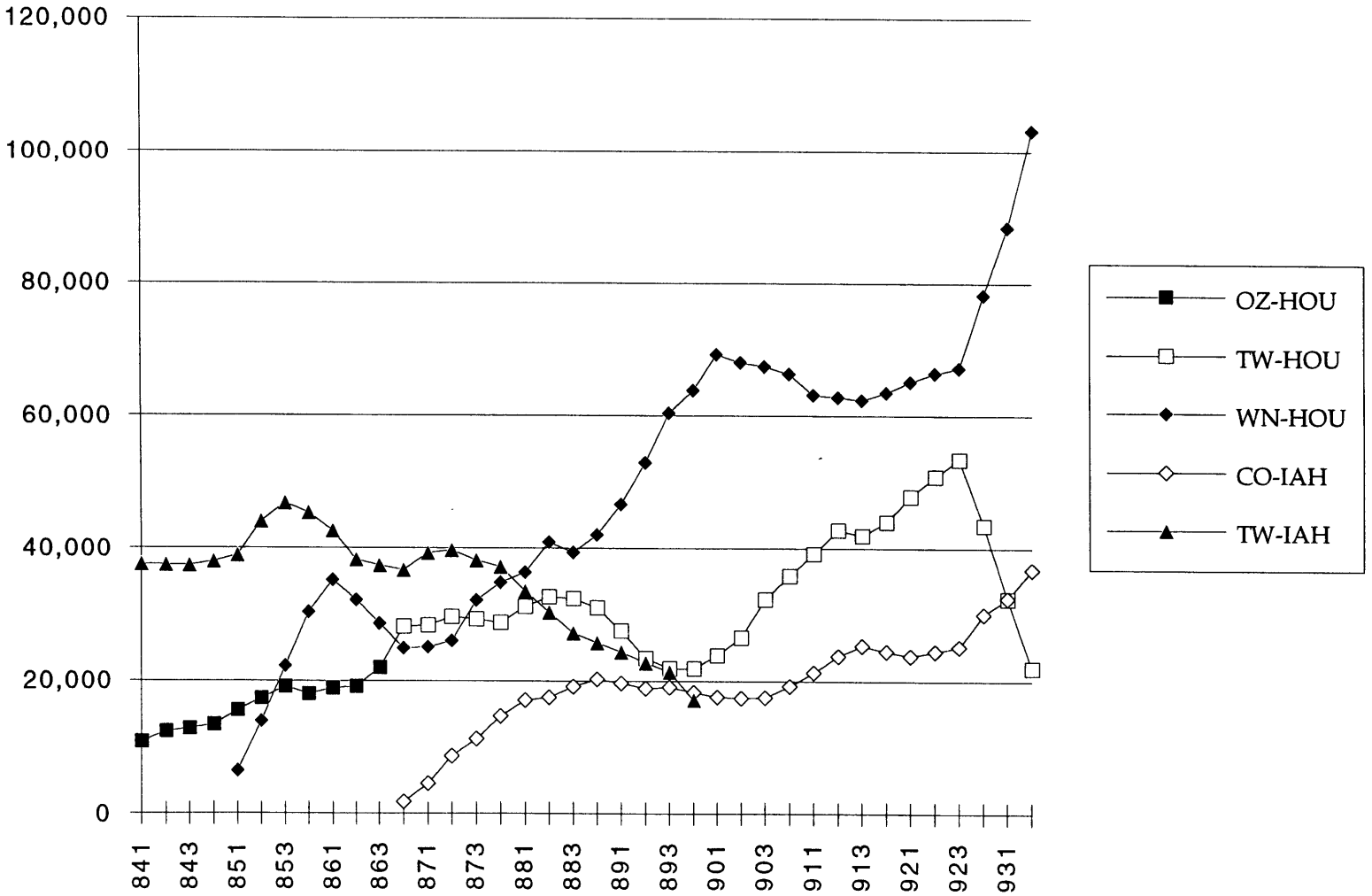


Figure 6.245 Houston-St. Louis: Average Quarterly Load Factor (%)

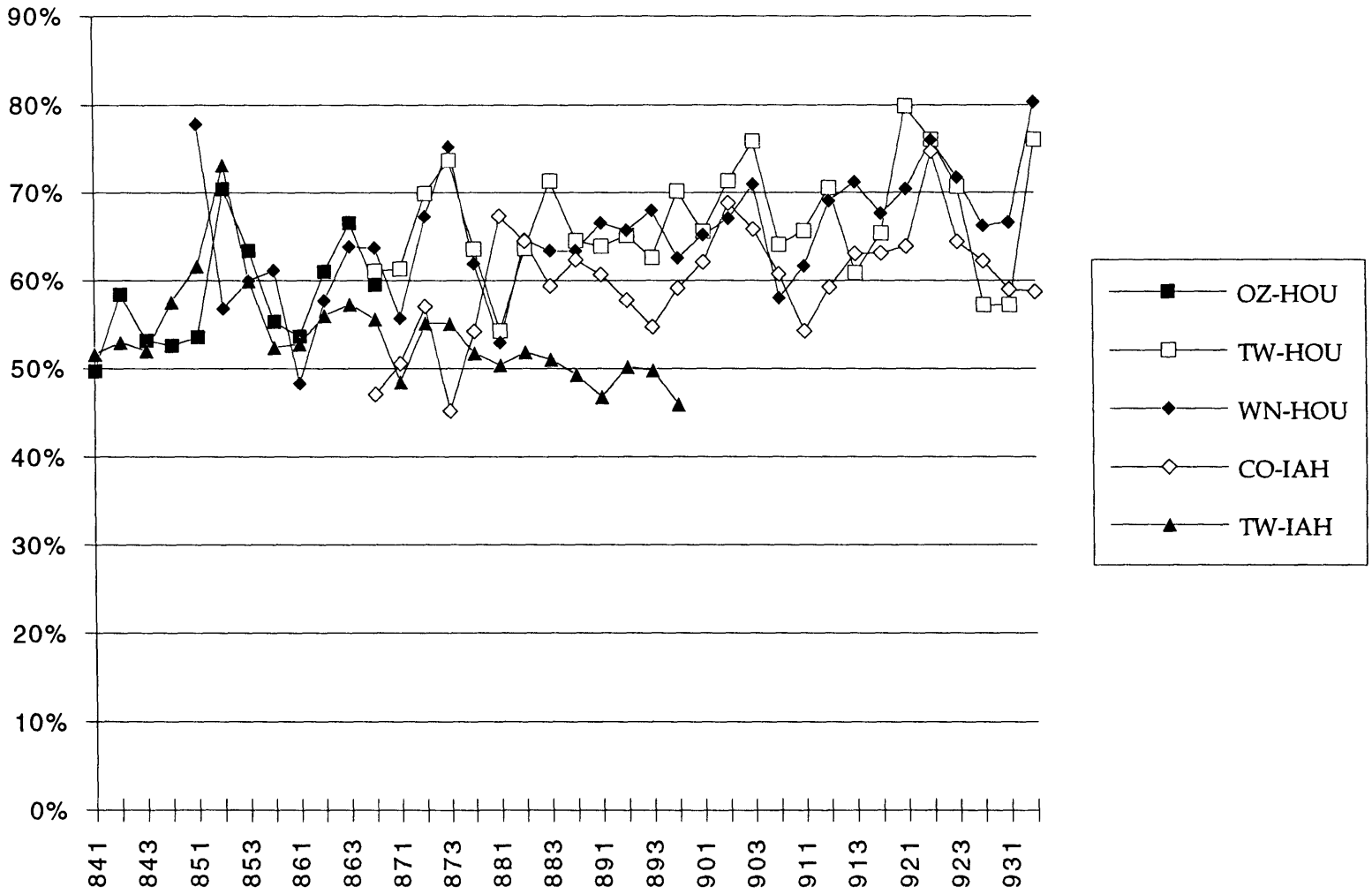
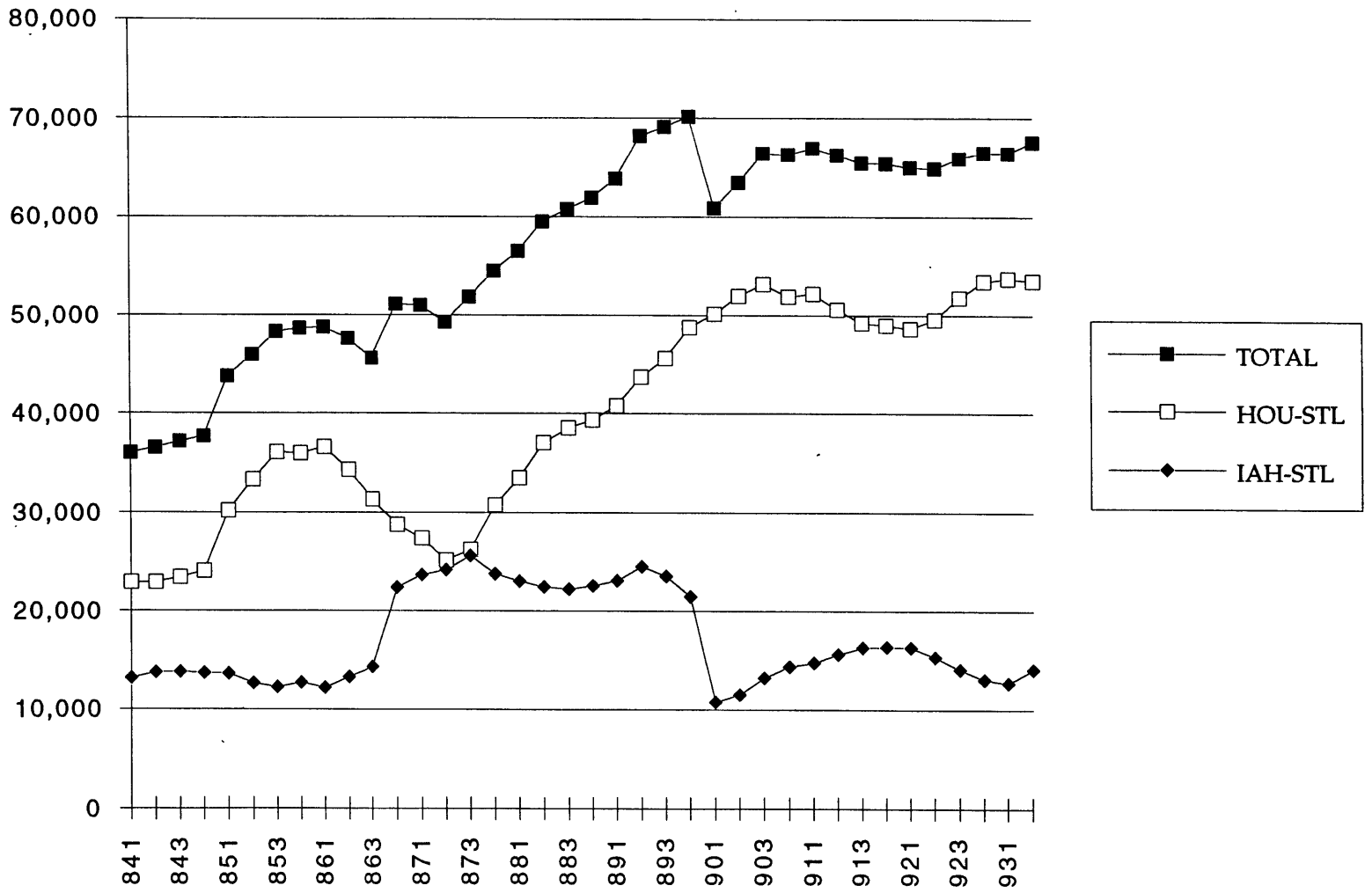


Figure 6.246 Houston-St. Louis: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.31 Scenario 3: Chicago-Denver (MDW/ORD-DEN, Distance = 914 miles)

Preliminary Remarks

With its hub operations at both Chicago O'Hare and Denver, its consistently superior frequency share, and its relatively competitive fares, United was the leader in the ORD-DEN OD market throughout the years examined. However, United was less successful in the parallel MDW-DEN market because it did not channel muc. of its resources in developing the service, as can been seen by the disproportionately lower frequency of service (Figure 6.313) in this market. However, despite its strength, United had to contend with several competitors: Continental, which has a hub at Denver; American, which has a hub at ORD as well; and Midway Airlines, which has a hub at MDW. Frontier, which was later acquired by Continental, could be labeled as a minor player in the ORD-DEN market (Figure 6.311) while Continental captured more OD traffic than United in the smaller MDW-DEN market. The following discussion attempts to give reasons for the failure of the four challengers -Frontier (ORD-DEN), Continental (MDW-DEN), Midway (MDW-DEN), and United (MDW-DEN) - in maintaining their presence when faced with strong rivals (American, United and Continental) at ORD.

Passengers' Response To Challengers

Before Frontier's entry in the ORD-DEN market in the first quarter of 1985, each airline's share of OD traffic (Figure 6.311) was roughly in-line with its frequency share (Figure 6.313): United, with eight departures a day, was the favorite, while Continental, with six departures was runners-up. American was least popular since it only offered five departures per day. The entry of Frontier with just three departures per day in early 1985, with its slightly lower fares, initially lured about 8,000 new OD passengers per quarter (Figure 6.313). While Continental and American seemed to have ignored Frontier's entry, United, beginning the third quarter of 1985, waged a frequency war against Frontier by rapidly boosting frequency from eight to 11 departures per day within just five quarters. However, United's aggressive efforts affected Continental instead of Frontier because it was Continental which lost about 15,000 OD passengers per quarter in that time, whereas Frontier achieved marginal gains in OD traffic by just adding one departure per day each way. With average fares plunging to a record low of $60 in the second quarter of 1986 (Figure 6.312) from a former high of $120 in 1984, Continental was the unlucky loser amongst the four airlines. Even American was successful in attracting more OD passengers without having to alter its frequency of service.

Although United did not end its frequency war until the second quarter of 1987, the quarter it initiated service between MDW and DEN, its OD traffic share reached the pinnacle in the same quarter that the second challenger, Continental, inaugurated service between MDW and DEN. With only three flights per day, Continental's service between MDW and DEN, the first of its kind, received a warm welcome as 8,000 new OD passengers came forward instantaneously to patronize the new service, which was priced below that of its competitors at ORD. The second stimulus in OD traffic between MDW and DEN was observed when Midway seized the opportunity to offer service to and from MDW in the quarter after Continental's entry. This time, by offering the same frequency as Continental, Midway's similarly low introductory fares captivated the hearts of even more passengers (17,000) in the first quarter of 1987. However, the creation of the new MDW-DEN market, a genuine alternative for air travelers, might have adversely affected United and American's operations at ORD since both carriers suffered a significant loss of about 10,000 OD passengers per quarter in the few quarters after Midway and Continental's entry at MDW. Convinced that the MDW-DEN market could be a successful venture, United too entered the fray in the third quarter of 1987, but failed to attract its pool of OD passengers because it offered a much higher fare (Figure 6.312) than its rivals at MDW. An inexplicable anomaly is that passengers did not respond to United's offer of exceptionally low fares of below $100 for its ORD-DEN services during the quarter just after it had introduced the MDW-DEN services. Yet, as soon as Continental abandoned the MDW-DEN service at the end of 1988, some passengers flocked to United because United had, by then, matched Midway's fares, though not the frequency.

With three airlines operating in full-force in the MDW-DEN market, passengers were turning away from United's ORD-DEN services since United had decided to cut-back on frequency from a high of 14 to 10 departures per day each way by early 1989. OD passenger boardings on United's ORD-DEN flights decreased further once United's MDW-DEN operations were perceived as a replacement for Continental's MDW-DEN service, a service which Continental withdrew at the end of 1988. Then, the temporary suspension of United's service in the MDW-DEN market allowed Midway to capture more passengers until Midway left the market at the end of 1991, after which United re-entered the MDW-DEN market, though for only two quarters. Some passengers were still keen on United's service at MDW even though United only offered one flight per day. However, when services between MDW and DEN came to an end in the third quarter of 1992, American finally took second place in terms of OD traffic share in the ORD-DEN market perhaps because it offered, beginning in 1990, one more departure

than Continental. Otherwise, United, with its 10 flights per day, was still the air traveler's all-time favorite even though the service was to and from a less accessible airport in the Chicago area. Thus, while services between MDW and DEN were a genuine alternative to that between ORD and DEN, most passengers still preferred airlines that offered a larger number of departures to and from ORD.

Airlines' Response To Challengers

A cursory glance at the average load factor profile (Figure 6.315) indicates that the airlines made rational decisions with respect to the provision of capacity in the Chicago-Denver market. All airlines in the market achieved healthy load factors that exceeded 50%, with United (ORD) and Continental (ORD) leading the way with load factors that were usually between 60% and 80%. Even Frontier, a minor player which carried as many non-OD passengers as OD passengers, was able to secure load factors that were between 60% and 80%. Although Frontier's entry into the ORD-DEN market did seem to incite United, United's double-hub operation at ORD and DEN gave it an additional reason to boost frequency for it was well able to attract as many as 250,000 non-OD passengers per quarter, which is about two-and-a-half times the size of its quarterly OD traffic. Although United's MDW-DEN service was unappealing to OD passengers, the thrice daily service managed to lure as many as 40,000 non-OD passengers per quarter, and thus helped United maintain average load factors of around 50% in this smaller market. However, United may have discontinued the service because the service was not appealing to OD passengers even though it matched the frequency of Continental (MDW) and Midway (MDW).

The entry of Continental, Midway and United at MDW seemed to have prompted American to match the frequency of service of these airlines since American eliminated one departure per day in the fourth quarter of 1987, much to its own detriment because OD traffic plunged from a high of 25,000 per quarter to 10,000 per quarter shortly after. Having realized its mistake, American gradually recaptured its share of OD traffic by restoring the frequency of service to four departures per day. With the fewer departures that it offered and with only a hub at ORD, American, unlike United, secured almost as many non-OD passengers as OD passengers, thereby making the ORD-DEN service viable with load factors that hovered around the 50s and 60s.

Continental, with its hub at DEN, was by far more successful with its ORD-DEN operations than its MDW-DEN operation because it allocated more flights in this market than in the parallel MDW-DEN market. Continental was able to secure a large number of non-OD passengers in 1985, 1986, and 1987 on its ORD-DEN services, but

the non-OD traffic began to dwindle as United picked-up more non-OD passengers. Yet, to maintain a consistently high load factor of around 60% to 70% when it was losing its share of OD and non-OD traffic towards the late 80s and early 90s, Continental reduced frequency by one departure per day by the third quarter of 1988. Its MDW-DEN service performed worse than the ORD-DEN services in terms of load factors even though non-OD traffic outnumbered OD passengers by a factor of two.

Midway, very content with its offer of three flights a day, experienced huge fluctuations of 20% in the average load factor, but maintained the service between MDW-DEN because load factors were between 50% and 70%, and that it had secured a stable pool of OD passengers and a slightly larger number of non-OD passengers. In fact, as the most successful entrant in the MDW-DEN market, Midway may have fended its turf so well that United and Continental had learnt that it was not viable for them to operate to both ORD and MDW if there were a disparity in frequency in the two parallel markets. The overall picture, though, is that airlines operating in the MDW-DEN market were content with offering just four departures per day; an attempt was not made to match the frequency offered by airlines in the parallel ORD-DEN market. As such, flights to and from ORD were still more popular than those at the more accessible airport of Midway.

Concluding Remarks

The Chicago-Denver market highlights the competitive behavior of airlines in a scenario whereby one of the airlines has a hub at both ends. Here, United certainly had a disproportionate share of the OD and non-OD traffic because it was willing to devote its resources to establishing a large presence in the Chicago-Denver market by offering the most number of departures between its two hubs of ORD and DEN. However, both United and Continental may have learnt that since passengers do respond to frequency more than accessibility, offering fewer flights in the parallel MDW-DEN did not necessarily reap significant benefits. All in all, air travelers in the Chicago-Denver market did not really benefit much from the entry of the challengers since fares, which did go down in 1986, eventually rose again by the late 80s. Figure 6.316 indicates that the low fares and United's boosting frequency between ORD and DEN may have stimulated OD travel in the mid-80s, but overall growth in travel was dampened once services at MDW were available even though Continental (MDW) and Midway (MDW) successfully created the MDW-DEN market when they initiated services. Nevertheless, the increase in total OD traffic from 90,000 in the first quarter of 1984 to 140,000 by the first quarter of 1993 is quite impressive, regardless of how the increase was achieved.

Figure 6.311 Chicago-Denver: Smoothed Quarterly OD Traffic

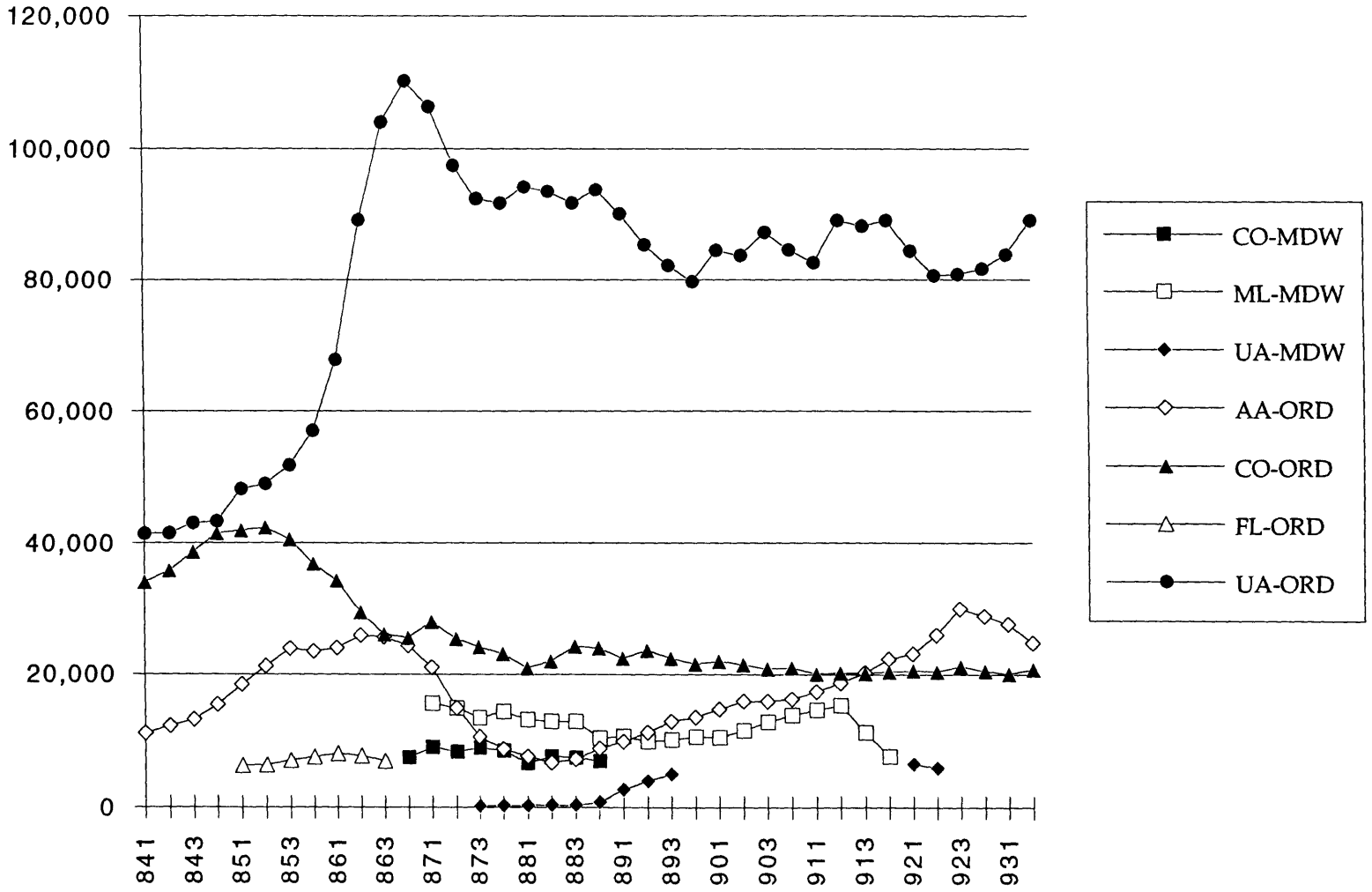


Figure 6.312 Chicago-Denver: Average One-Way Fare ($)

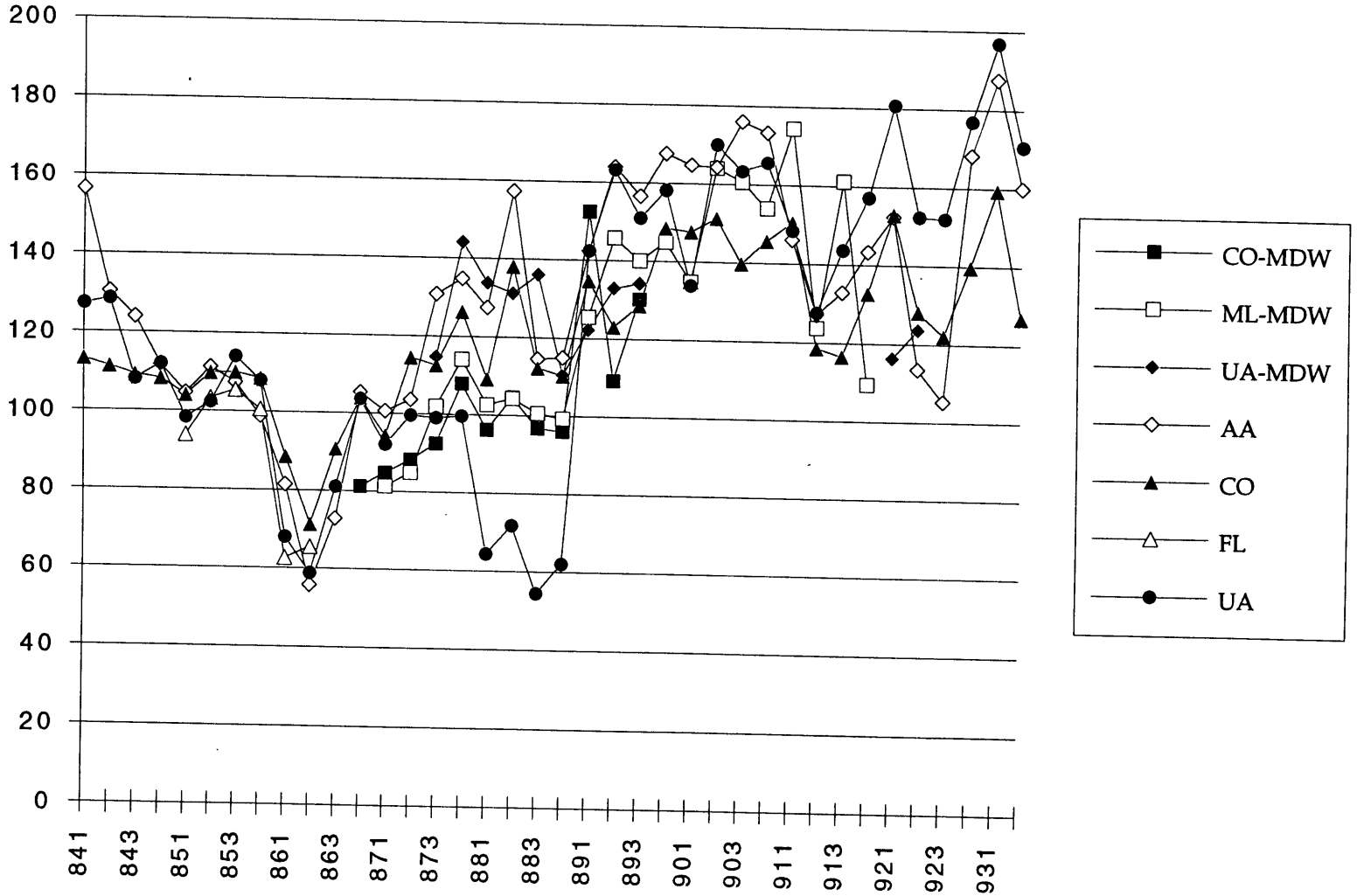


Figure 6.313 Chicago-Denver: Average Number Of Departures Per Day Each Way

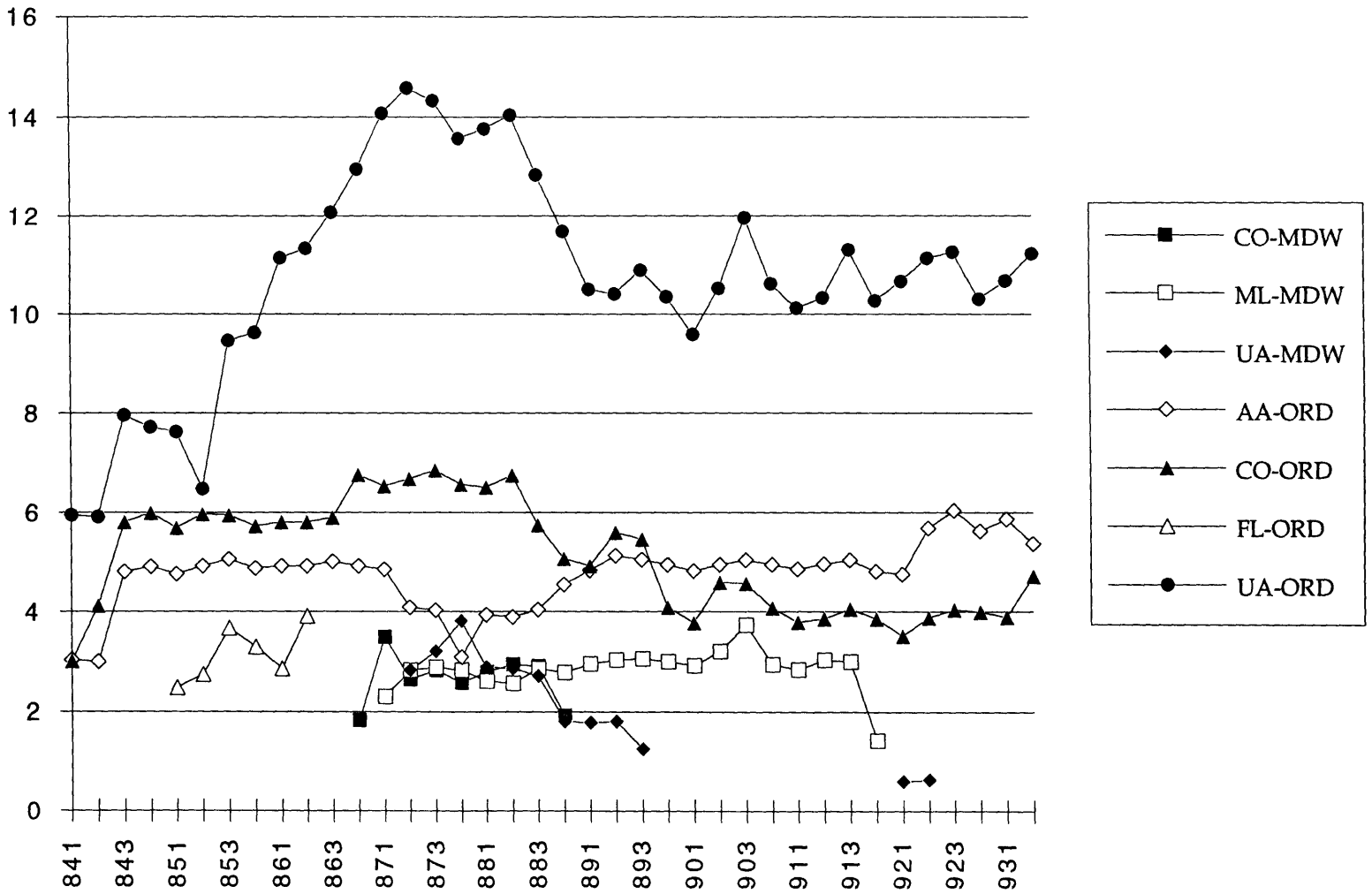


Figure 6.314 Chicago-Denver: Smoothed Quarterly Non-OD Traffic

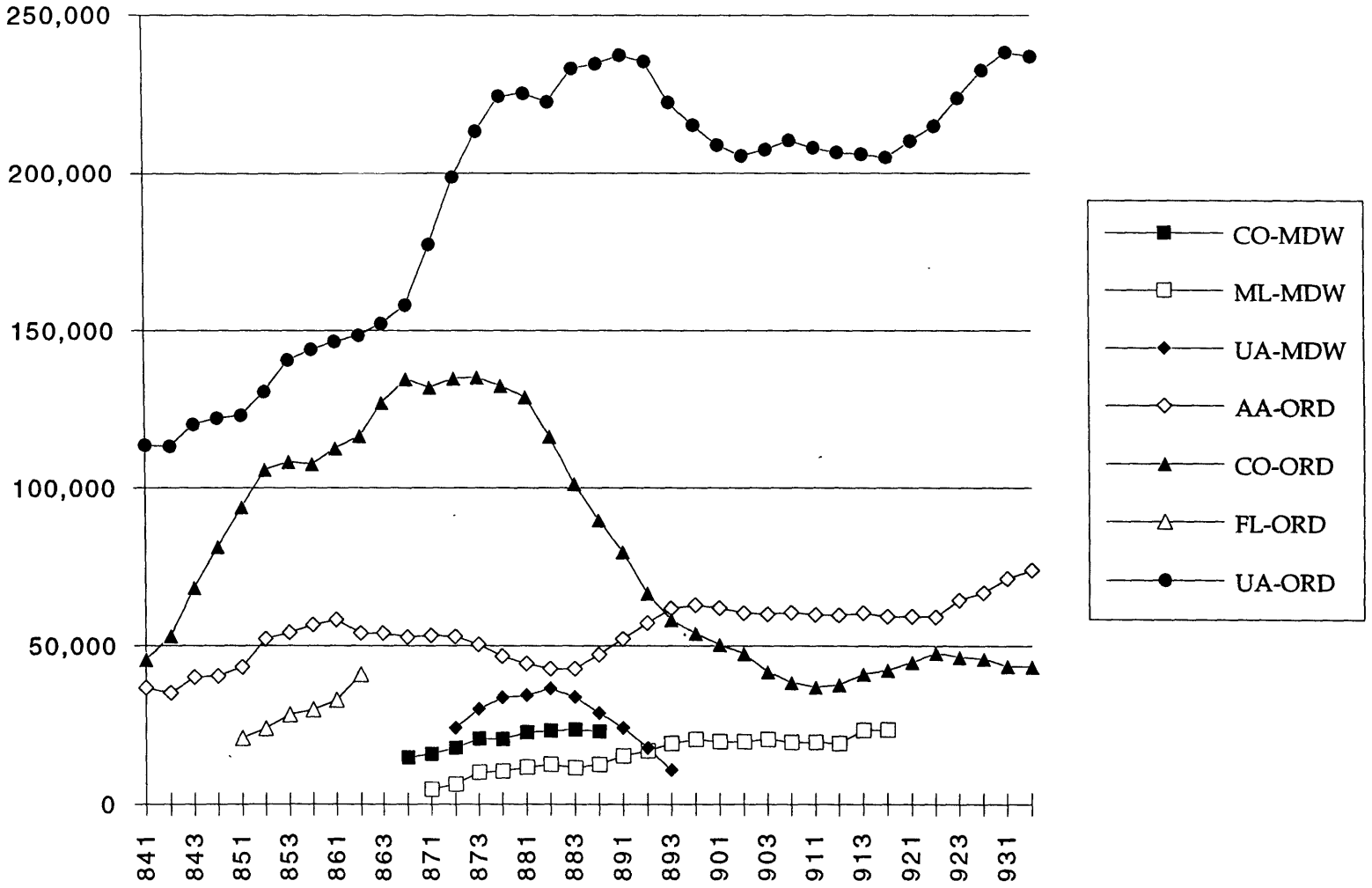


Figure 6.315 Chicago-Denver: Average Quarterly Load Factor (%)

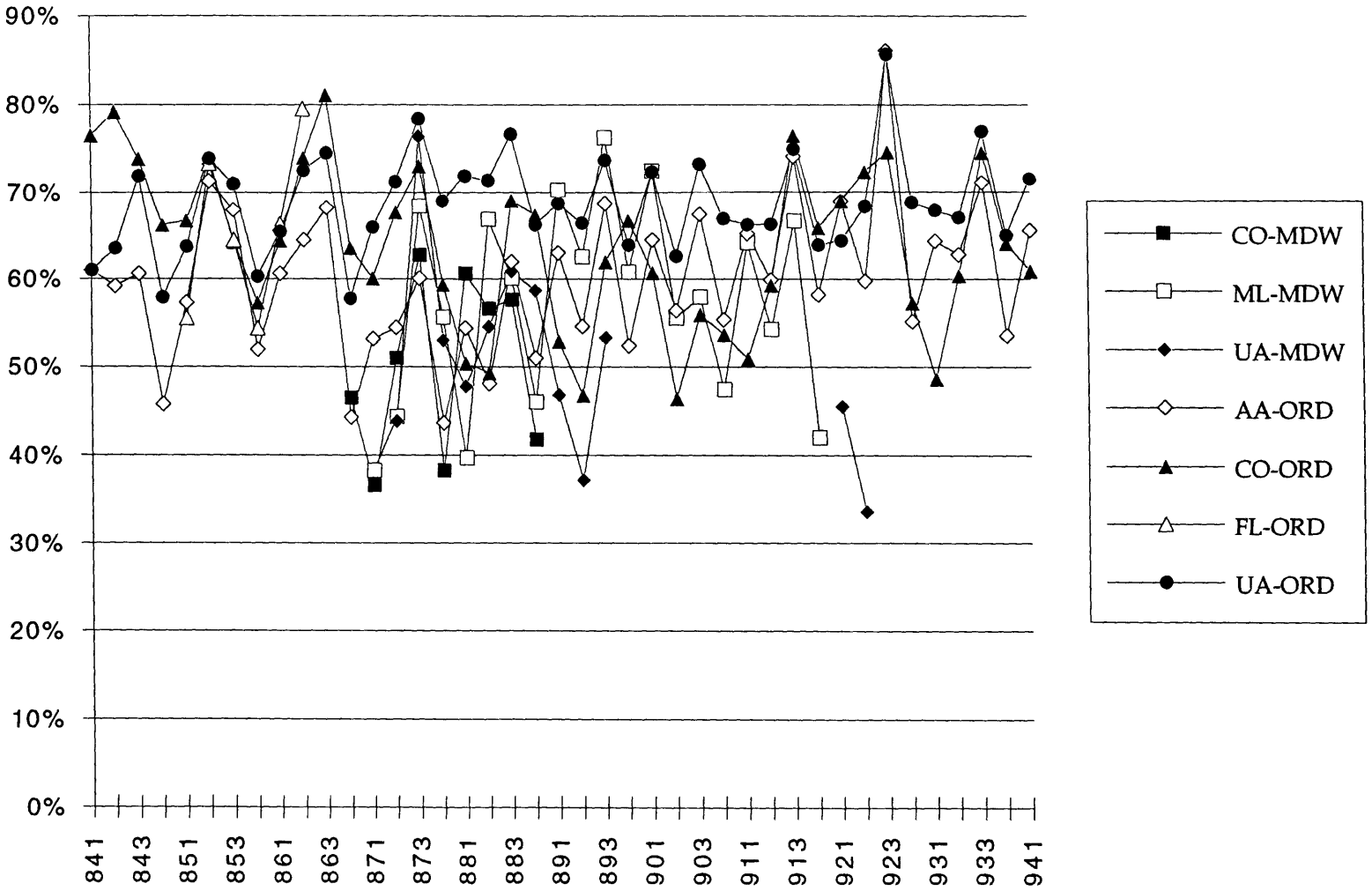
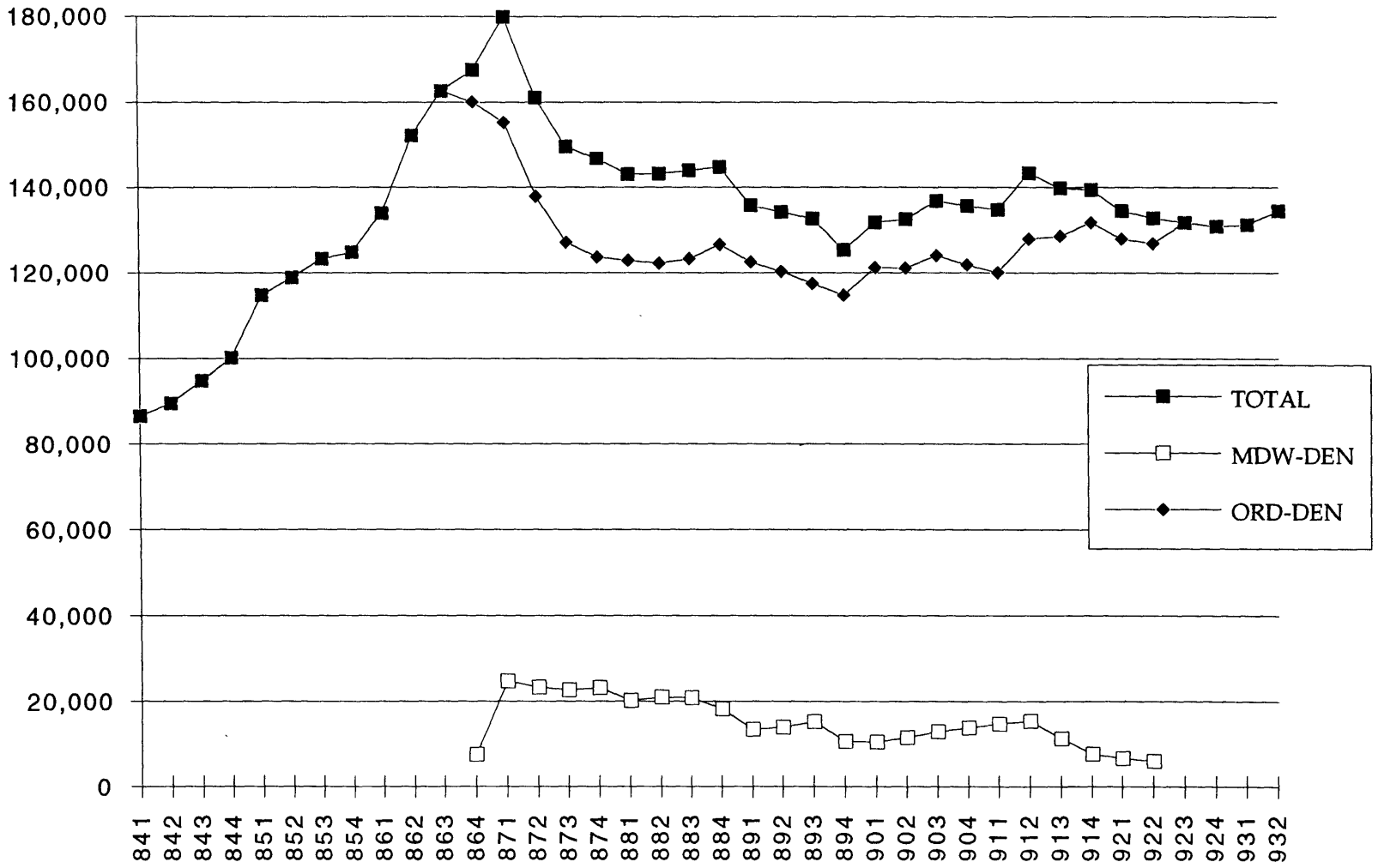


Figure 6.316 Chicago-Denver: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.32 Scenario 3: Chicago-Nashville (MDW/ORD-BNA, Distance = 399 miles)

Preliminary Remarks

The Chicago-Nashville market is very different from any of the markets analyzed so far for the reason that the entry of Southwest in the MDW-BNA market essentially stimulated travel between the two cities, as Figure 6.321 and 6.326 show. Even American, which had hubs at both ORD and BNA, took second place in OD market share despite its confrontation with Southwest beginning in late 1991, whereby it offered more departures than Southwest. Unlike United in its operations in the ORD-DEN market, American, with its dual-hub system at ORD and BNA, could not be the leader in market share because it offered appreciably higher fares than Southwest after offering more departures than Southwest after 1991. One could also postulate that United may have been spared in the ORD-DEN market because Southwest did not enter that market. The Chicago-Nashville market is also unusual in that the incumbents, Delta and Republic, were on their way out shortly after 1984; the challengers - United, Southwest, and American - were, in a sense, the replacements for Delta and Republic.

Passengers' Response To Challengers

In the first quarter of 1984, when Delta and Republic were the only carriers offering nonstop services between ORD and BNA, passengers, faced with similar fares, favored Republic over Delta because Republic offered one departure more than Delta. United's entry in the ORD-BNA market in the second quarter of 1984 with the same fares as Delta and Republic and the same number of departures as Republic instantaneously attracted about 3,000 new passengers (Figure 6.321). Then, as United lowered its fare and frequency in the subsequent four quarters, it gradually gained its share of OD passengers. With the exit of Delta at the end of 1984, passengers were left with a choice of either flying Republic or United, but Republic secured more OD passengers than United because of its frequency advantage.

The entry of Southwest in the first quarter of 1986 in the new MDW-BNA market, with a higher frequency and an average fare that was about $50 lower than the incumbents, merely resulted in minor stimulation of travel - just 5,000 passengers (Figure 6.321). Southwest only captured an additional 3,000 OD passengers in the second quarter of operations, while the last challenger, American, which offered service between ORD and BNA, immediately captured 14,000 OD passengers - slightly more than incumbent United in that same market. However, while the OD traffic in the ORD-BNA market remained fairly stable over the next few years, Southwest began to nurture its

monopoly market by boosting frequency from four to six departures a day and maintaining the low fare of just $60. Passengers responded exceptionally enthusiastically to Southwest's efforts since OD traffic soared from just 5,000 in the first quarter of 1986 to a zenith of 39,000 by the end of 1990, the year just before American decided to boost frequency between its two hubs. Between 1987 and 1991, passengers did not show a specific preference for United or American even though American offered higher fares and one more departure per day than United during several quarters (Figure 6.323).

At last, in 1991, passengers began to make a visible choice between airports when American progressively increased the number of departures from four to eight over the course of 1991 as it strengthened its hub at Nashville. One can see, from the right hand portion of Figure 6.321, that American's gain in OD traffic was Southwest's loss because of the switch-over from Southwest to American. Unfortunately, the diversionary effect was reversed when American raised its fares from a low of $70 in late 1991 to a high of $190 by the first quarter of 1993, whereby passengers preferred to pay the usual $70 for Southwest's seven departures than Americans' dearer eight or nine departures.

United was perhaps the most unresponsive competitor in the Chicago-Nashville market because it maintained its three departures per day for the longest time. It seemed complacent with its share of about 10,000 OD passengers each quarter. By offering the lowest frequency of service (three departures per day) at significantly higher fares than Southwest (Figure 6.322), some passengers did begin to shun United after 1991.

Airlines' Response To Challengers

As far as airline behavior is concerned, one can see that United's entry in the ORD-BNA market with the same frequency and fares as Republic instigated Republic to boost frequency to give itself an edge over United. Delta, which had to contend with load factors that were in the vicinity of 30%, had apparently given up hope of competing with United and Republic, and hence, left the market at the end of 1984. Republic, which saw its OD traffic increase slightly but was fast losing non-OD traffic, finally abandoned the fight with United since load factors declined to about 30% in the quarter just before it abandoned the ORD-BNA market and merged with Northwest. United did not respond to Southwest's entry since it did not match Southwest's frequency or low fares. Further, United did not really perceive American as a threat even though it shared the same hub as American at ORD. Yet, with its mix of OD and non-OD passengers standing at a ratio of about 1:3, United's service was viable because it achieved load factors that fluctuated between the 40s and early 60s, particularly after it

established itself in the market in 1985. With its higher fares between 1989 and the first quarter of 1991, American added one departure per day but passengers did not respond until the second quarter of 1990, a time when American did attract more passengers than United. However, between the second quarter of 1987 and the first quarter of 1991, since Southwest's superior frequency was uncontested, Southwest became the undisputed leader in market share. American was only successful in drawing passengers away from Southwest when it boosted frequency quite suddenly beginning in 1991. Despite the fact that Southwest did not have a strong hub at either MDW or BNA, it was well able to progressively attract a sizable number of non-OD passengers (Figure 6.324) - starting from a negligible number to 80,000 per quarter by 1993 - thereby allowing it to secure load factors that were typically in excess of 60%.

American, with its dual-hub operations, was the overall leader in non-OD market share; this helped it achieve favorable average load factors that were in the vicinity of 70%. In particular, American had an advantage over United and Southwest since it could well use Nashville as a gateway to Florida and the Southeast. Indeed, Southwest did plan a hub at Nashville, but immediately retreated when American announced its intention to hub at Nashville [52].

Concluding Remarks

In summary, one may conclude that the exit of Republic and Delta did not mean an end to direct air service between Chicago and Nashville. On the contrary, the entry of all three challengers stimulated OD travel, with Southwest clearly leading the pack in luring the OD travelers. Specifically, between the first quarter of 1987 and the second quarter of 1991, and after the third quarter of 1992, OD traffic between MDW and BNA exceeded that between ORD and BNA, thereby emphasizing the power of Southwest in creating demand for air travel to and from the more accessible airport of MDW. It is also in the Chicago-Nashville market that one sees how the low fare advantage, coupled with high frequency, helps capture OD passengers. Indeed, by examining the fare profile again, one notices that, except in the first and fourth quarters of 1991, American and United were not really attempting to match Southwest's consistently low fares. After all, Southwest considered the Southeast as an arena of untapped opportunity, upholding the belief that the region is "underserved and overpriced" [52] if not for its entry. Figure 6.326 does provide evidence that air travelers have reaped benefits from Southwest's service because OD traffic tripled very quickly with the entry of Southwest in the MDW-BNA market.

Figure 6.321 Chicago-Nashville: Smoothed Quarterly OD Traffic

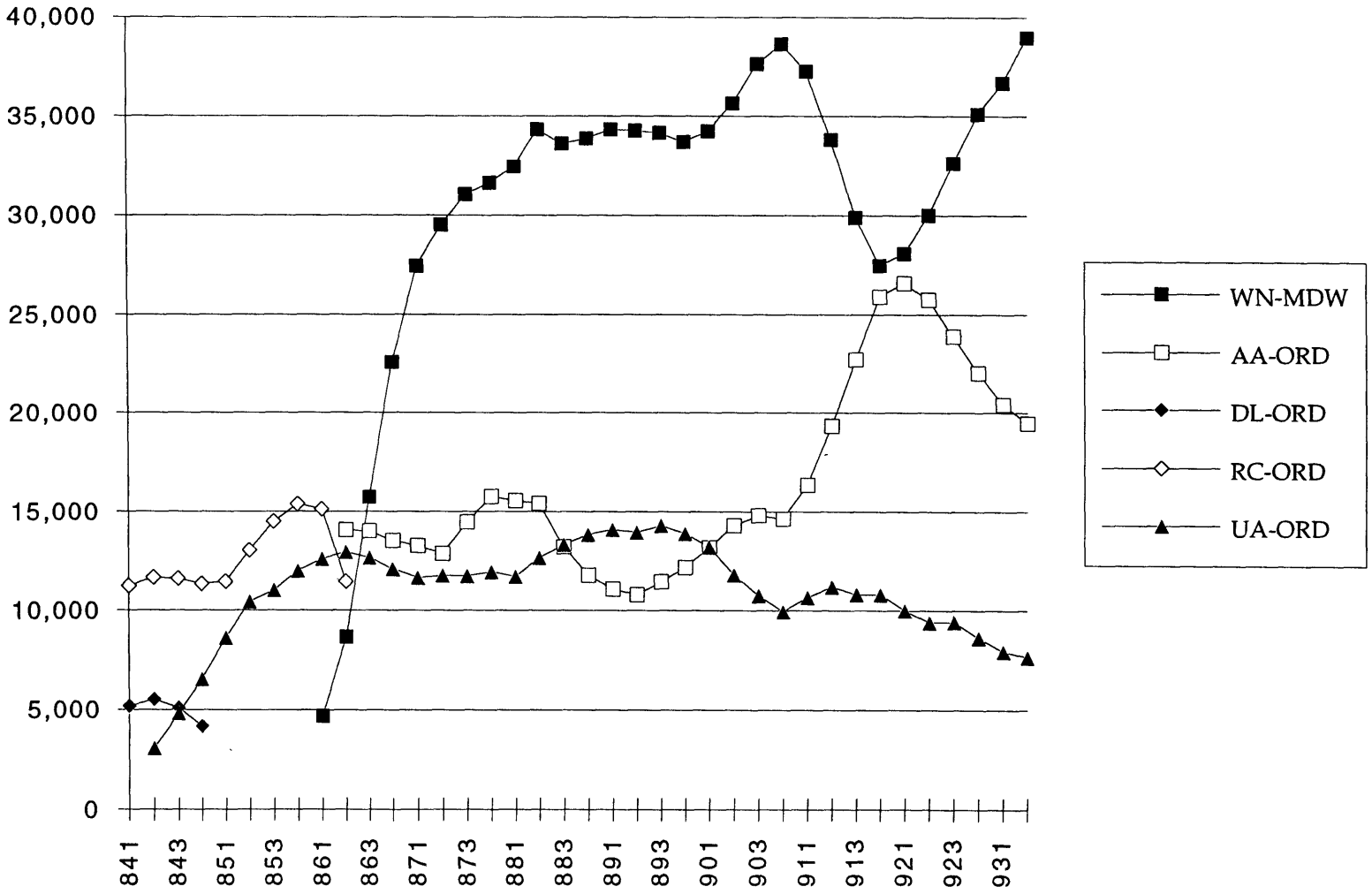


Figure 6.322 Chicago-Nashville: Average One-Way Fare ($)

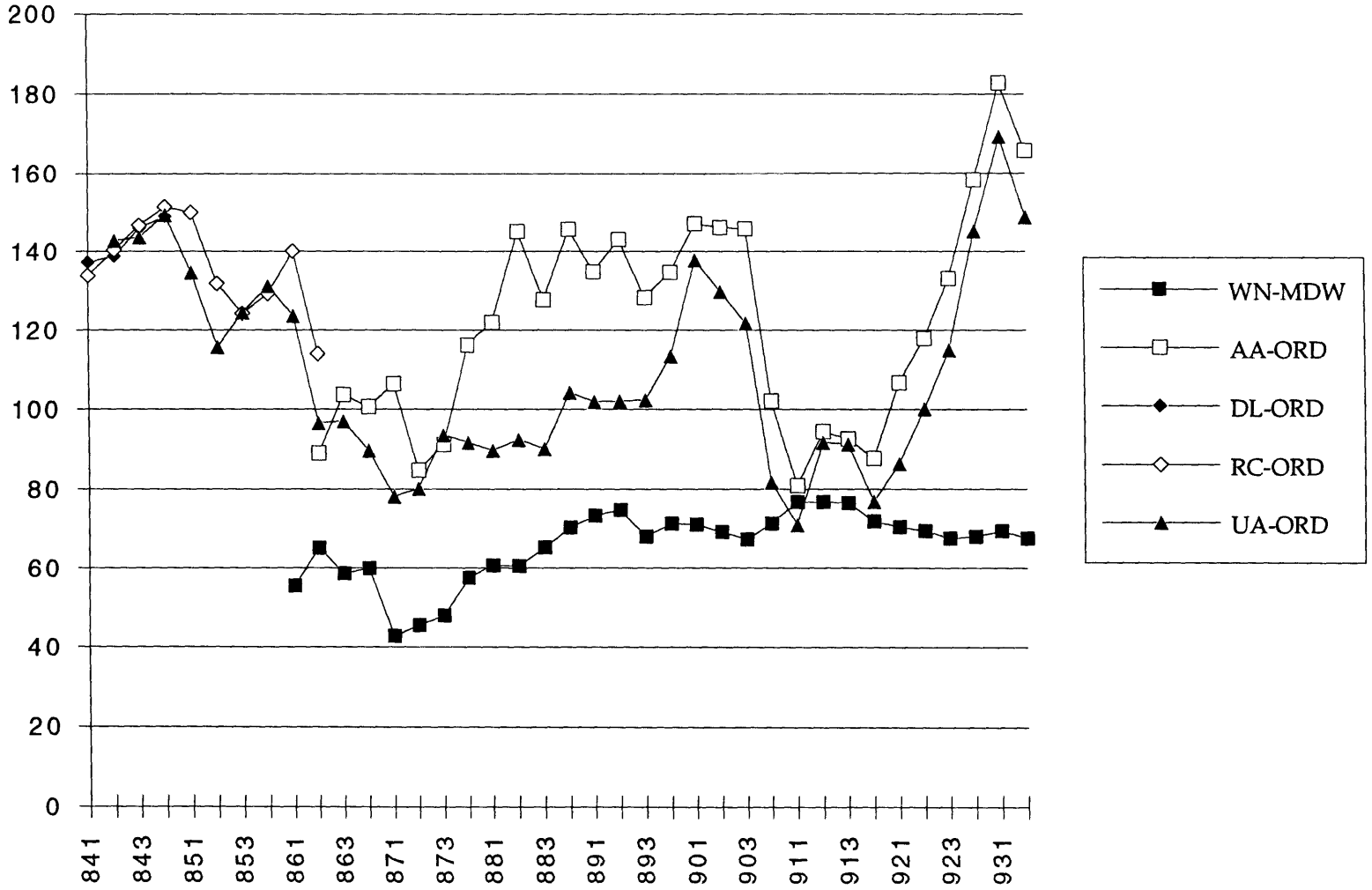


Figure 6.323 Chicago-Nashville: Average Number Of Departures Per Day Each Way

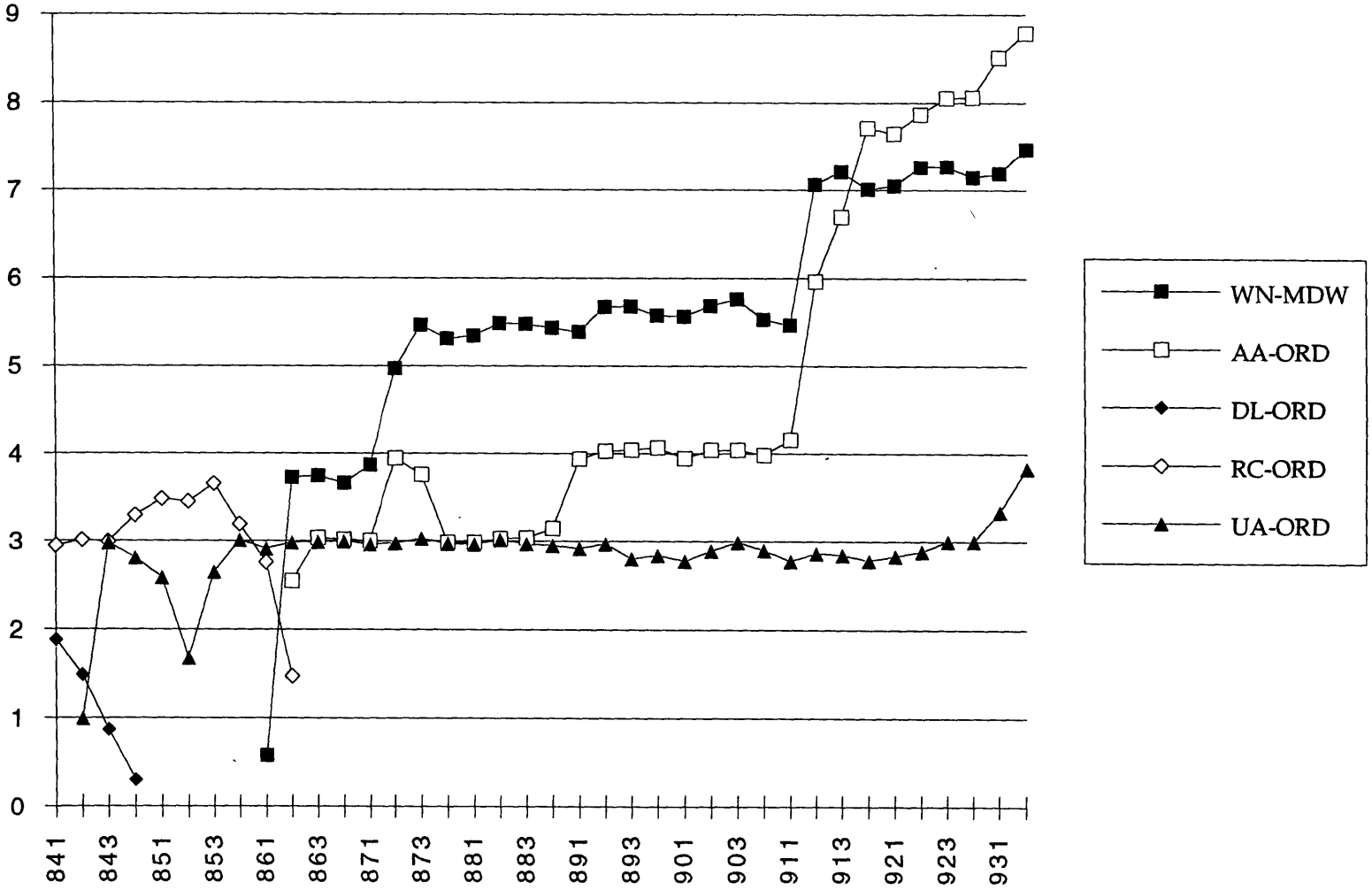


Figure 6.324 Chicago-Nashville: Smoothed Quarterly Non-OD Traffic

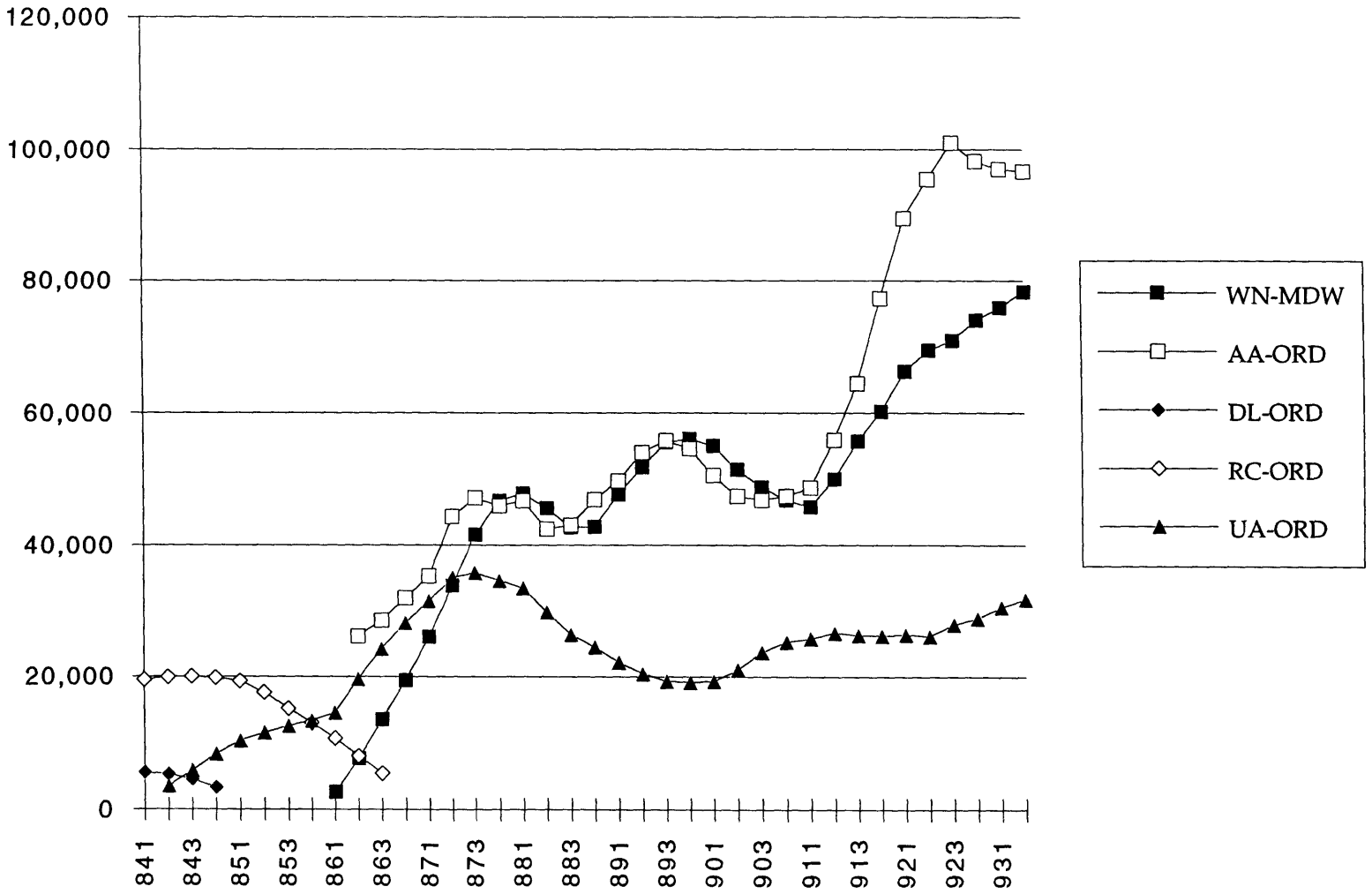


Figure 6.325 Chicago-Nashville: Average Quarterly Load Factor (%)

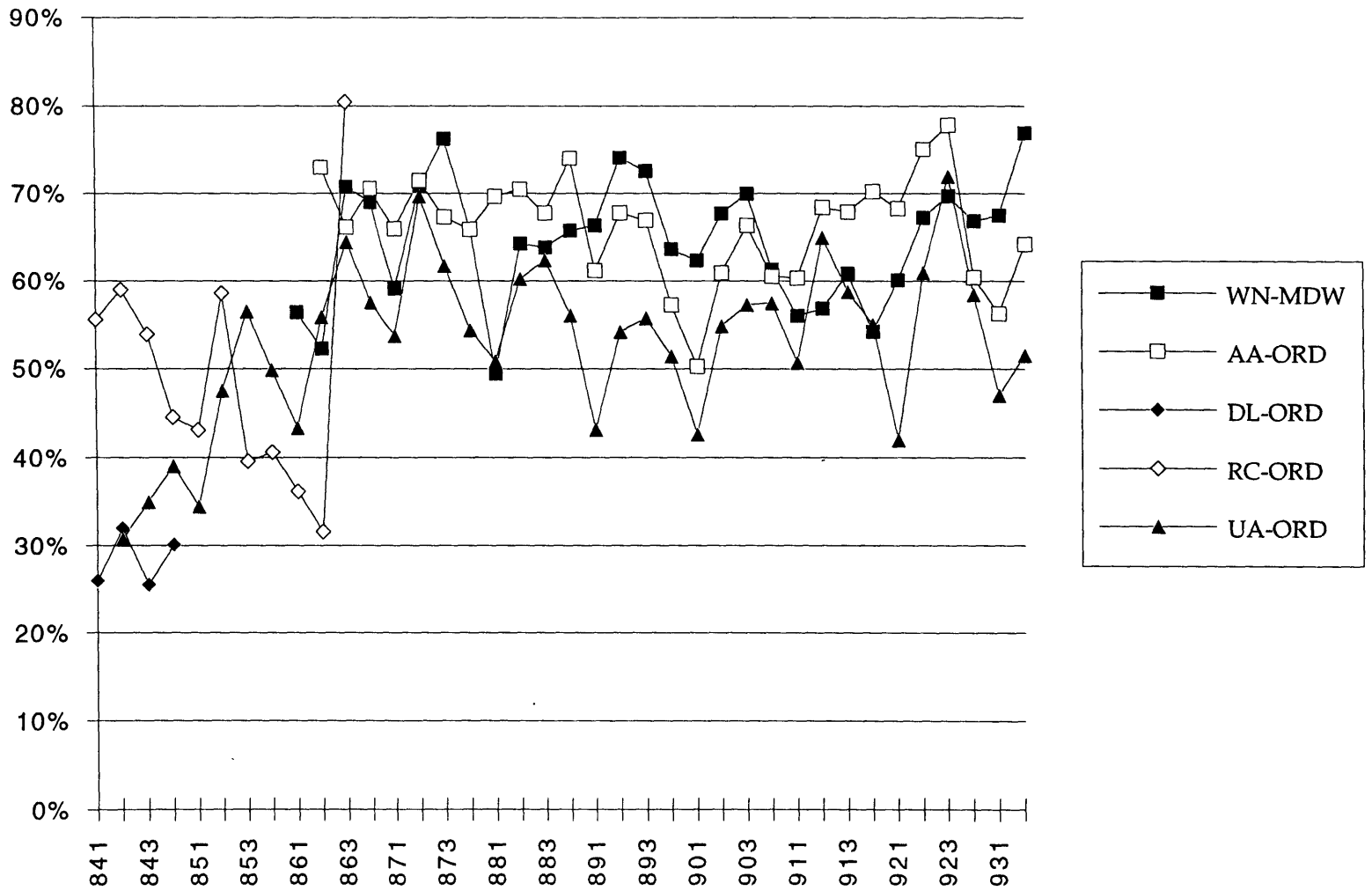
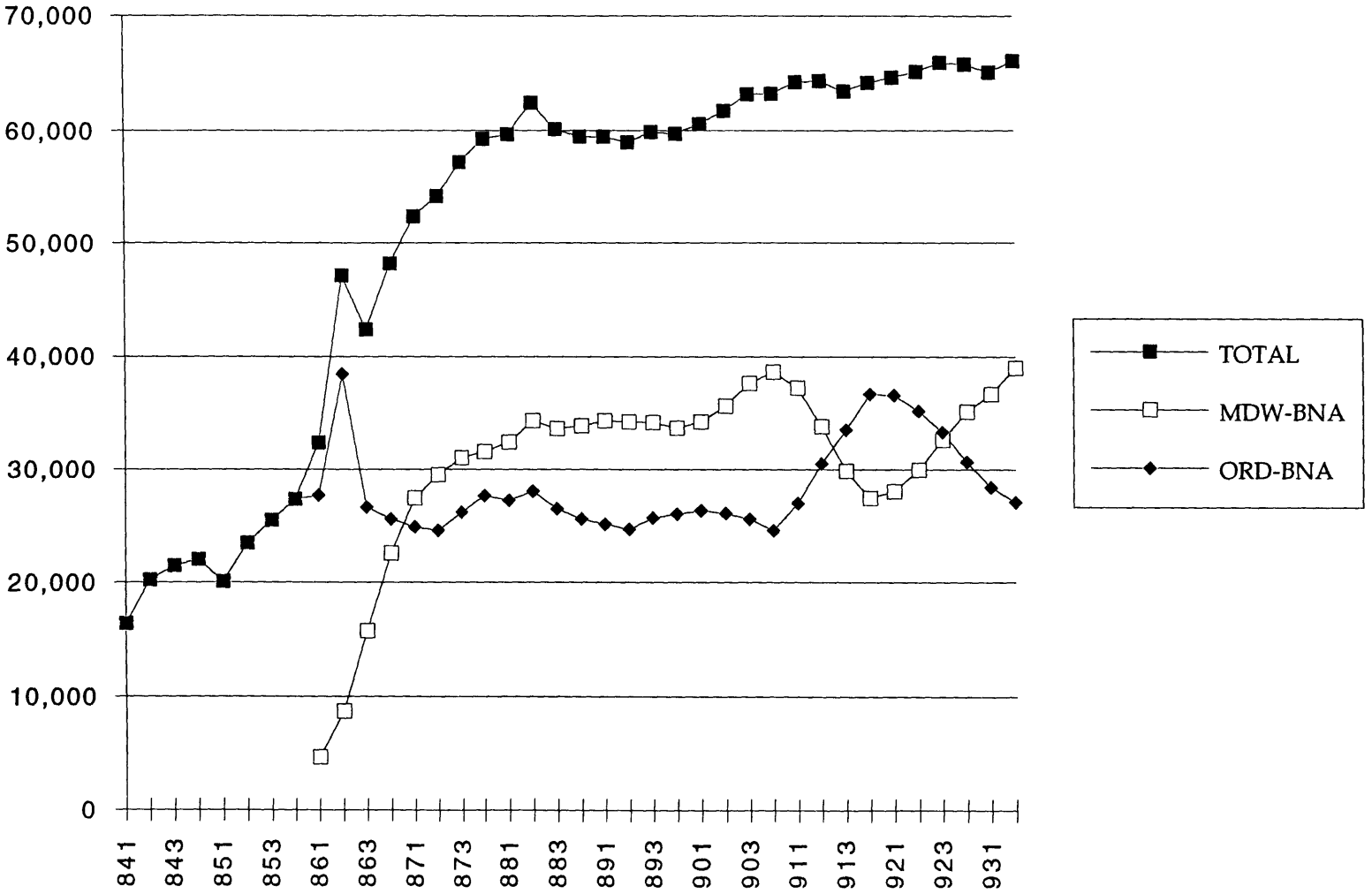


Figure 6.326 Chicago-Nashville: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.33 Scenario 3: Houston-Denver (HOU/IAH-DEN, Distance = 884 miles)

Preliminary Remarks

Figure 6.336 indicates that the Houston-Denver market did not grow even though two challengers, United and Continental, entered the parallel HOU-DEN market after Frontier was acquired by Continental in the middle of 1986. Like the Chicago-Denver market, where United devoted the most number of flights in the ORD-DEN market, Continental, with its hubs at IAH and DEN, was the undisputed leader in OD market share in the IAH-DEN market. Continental entered the HOU-DEN market for a few years before abandoning the market, much like the way United had entered the MDW-DEN market but finally withdrew the service. Without Southwest in the picture, the competitive dynamics in this market are in-line with what one expects: Continental, with its dual-hub system, is the clear winner in terms of overall OD market share. Indeed, the two challengers, United and Continental, were actually self-challengers who were interested in offering parallel services between HOU and DEN.

Passengers' Response To Challengers

Right at the onset, even before Continental's entry in the HOU-DEN market in 1986, passengers were basically choosing Continental's service between IAH and DEN because of the superior frequency (nine departures per day). However, with Frontier offering three departures per day between HOU and DEN, and United, four between IAH and DEN, fares and accessibility were the likely factors that swayed passengers to prefer Frontier over United. Specifically, by offering a lower fare and better service to and from the more accessible airport of HOU, Frontier's service attracted 20,000 passengers per quarter while United's between IAH and DEN, only 10,000 per quarter. Continental may have lost some OD passengers to Frontier as well, as the precipitous decline in OD traffic between the first quarter if 1984 and the first quarter of 1986 indicates (Figure 6.331).

The entry of Continental in the HOU-DEN market in the second quarter of 1986 was not well received initially even though Continental offered four departures per day. However, OD passengers began to show a very promising response - even after the elimination of one departure per day - almost a year later since OD traffic increased to a high of almost 30,000 in the second quarter of 1988. The corresponding decline in OD traffic in Continental's IAH-DEN market (Figure 6.331) perhaps indicates that passengers did switch to the new service that was to and from the more accessible airport of HOU. United, for being the minor player in the IAH-DEN market, suffered a

further loss of its already small share of OD traffic because it reduced frequency by one departure per day a year after Continental's entry in the HOU-DEN market. However, prompted by Continental's success in the HOU-DEN market, United initiated a challenge in the HOU-DEN market in the third quarter of 1988 with just two departures per day, one less than rival, Continental. Surprisingly, by offering the same frequency in both parallel markets, United attracted about the same number of OD passengers in both markets. It is clear though, from Figure 6.331, that United's entry did stimulate travel right from the first quarter, more so than Continental in its first quarter of entry in the HOU-DEN market. United's entry in the HOU-DEN market may have adversely affected Continental's competing service in the same market since OD traffic gradually declined in the quarters after the third quarter of 1988 (Figure 6.331). Another plausible reason for this decline is that passengers may have flocked to Continental's service at IAH because Continental was offering 10 flights per day in the IAH-DEN market as opposed to three (before the fourth quarter of 1991) in the HOU-DEN market. Continental's offer of only two departures per day beginning in the fourth quarter of 1991 may have made its service between HOU and DEN even less popular. At the same time, since United's two departures per day from IAH or HOU were just as unappealing; a large number of passengers may indeed have chosen to fly between IAH and DEN on Continental instead. In fact, the loss in OD traffic due to the self-challenge in 1986 was restored by the end of 1990 as passengers showed a renewed interest in Continental's high frequency service between IAH and DEN.

Airlines' Response To Challengers

By offering the highest frequency of service between IAH and DEN, and maintaining a hub at both IAH and DEN, Continental secured the largest share of non-OD passengers, thereby allowing it to achieve favorable average load factors that fluctuated between 60% and 70%. Frontier, which had a hub at DEN, carried as many non-OD passengers as OD passengers (around 20,000 per quarter) and was well able to maintain average load factors that were in the 60s and early 70s, thereby indicating that its service between HOU and DEN was viable. Continental, which essentially took over Frontier's operations at HOU, was successful only in 1988, when OD traffic soared to 30,000 per quarter. However, when OD traffic tapered and non-OD traffic did not increase after 1988, average load factors on Continental's service between HOU and DEN had fallen to around 50%.

United, which offered four flights per day between its hub at DEN and IAH, was able to fill its planes in the years prior to 1987 since it managed to secure four times as

many non-OD passengers as OD passengers. However, its halving of the number of departures in the second quarter of 1987 resulted in a loss of both OD and non-OD passengers, and the subsequent deterioration of the average load factors to just below 50%, a figure which never improved in the ensuing quarters. Even by not matching Continental's frequency in the HOU-DEN market, United's service between HOU and DEN attained load factors that were averaging around 50% most of the time even though non-OD traffic consistently outnumbered OD traffic by a factor of two. On the whole, regardless of the decisions the airlines made, one may say that each airline's service was viable since load factors did not fall below 40%. Continental may have withdrawn its service between HOU and DEN because it learnt that the service was less popular and that the average load factors were 10-15% lower than those in the IAH-DEN market, particularly after 1987.

Concluding Remarks

By examining Figure 6.336, one will notice the visible dip in total OD traffic between 1984 and 1986, which is attributed to the decline in OD traffic in the larger IAH-DEN market. The entry of the two challengers in the HOU-DEN market did affect the distribution of OD traffic at the two airports of HOU and IAH as the convergence of the curves for the total OD traffic in each market indicates (Figure 6.336). A reversal of fortune began to take place when United entered the HOU-DEN market because the curves diverged very visibly after 1988, thereby indicating that passengers' preferences had changed. Thus, while stimulation of OD traffic was not very noticeable in the Houston-Denver market as a whole, one could conclude that passengers were mainly choosing on the basis of frequency; IAH was preferred over HOU even though the former is less accessible. Continental was responsible for affecting the OD passenger's choice of airports since it was able to offer nine or 10 departures per day between its two hubs at IAH and DEN. United, with only a hub at one end, was trailing far behind in terms of OD and non-OD traffic, but it maintained the HOU-DEN service to at least give passengers a choice of airports. Lastly, the demand for air travel between the two cities may have been dampened since average fares had risen from around $100 in 1984 to $150 by 1993. While it is likely that Frontier was responsible for setting the floor for low fares, its exit brought an end to the low fares as Figure 6.332 shows.

Figure 6.331 Houston-Denver: Smoothed Quarterly OD Traffic

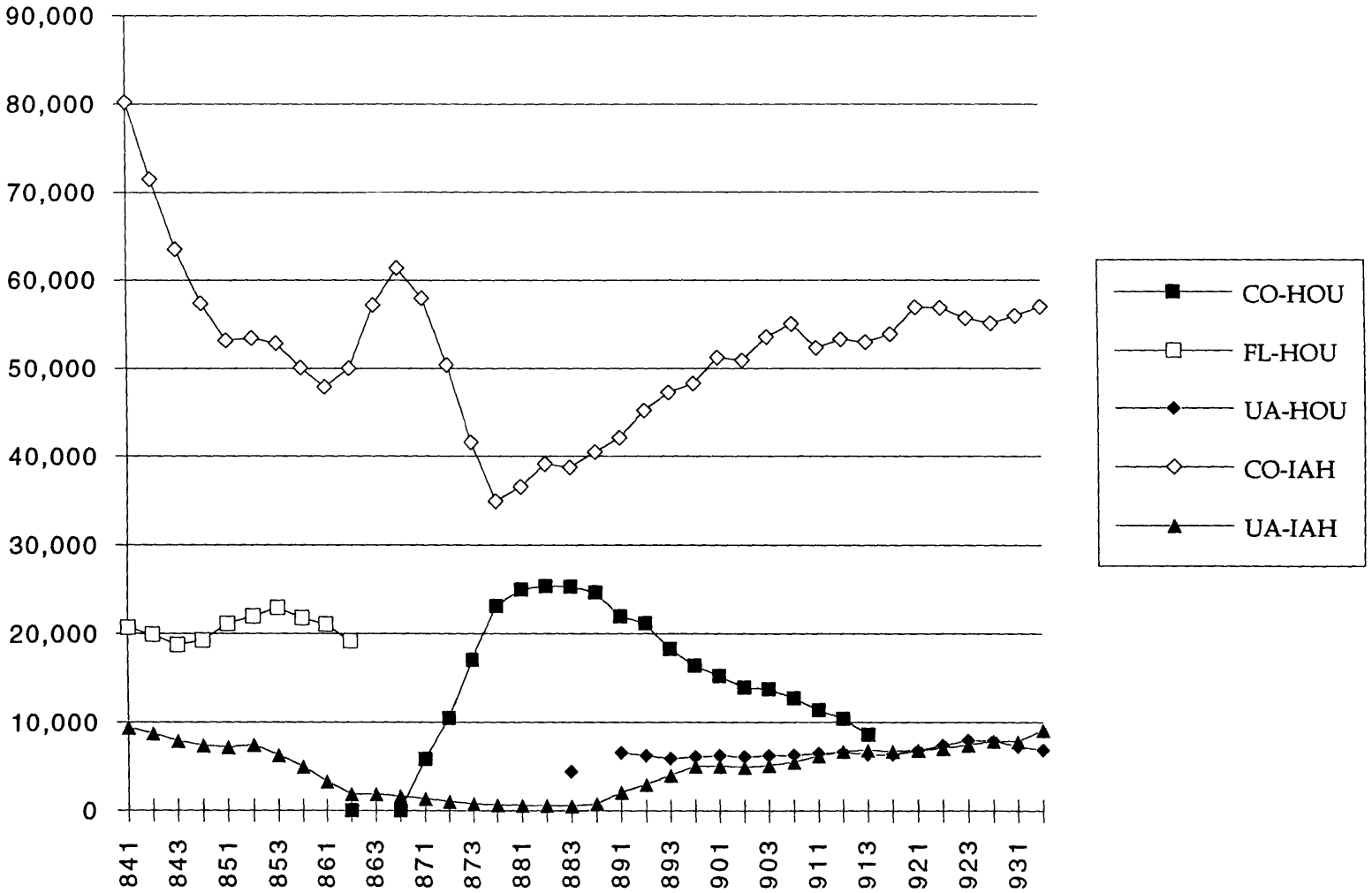


Figure 6.332 Houston-Denver: Average One-Way Fare ($)

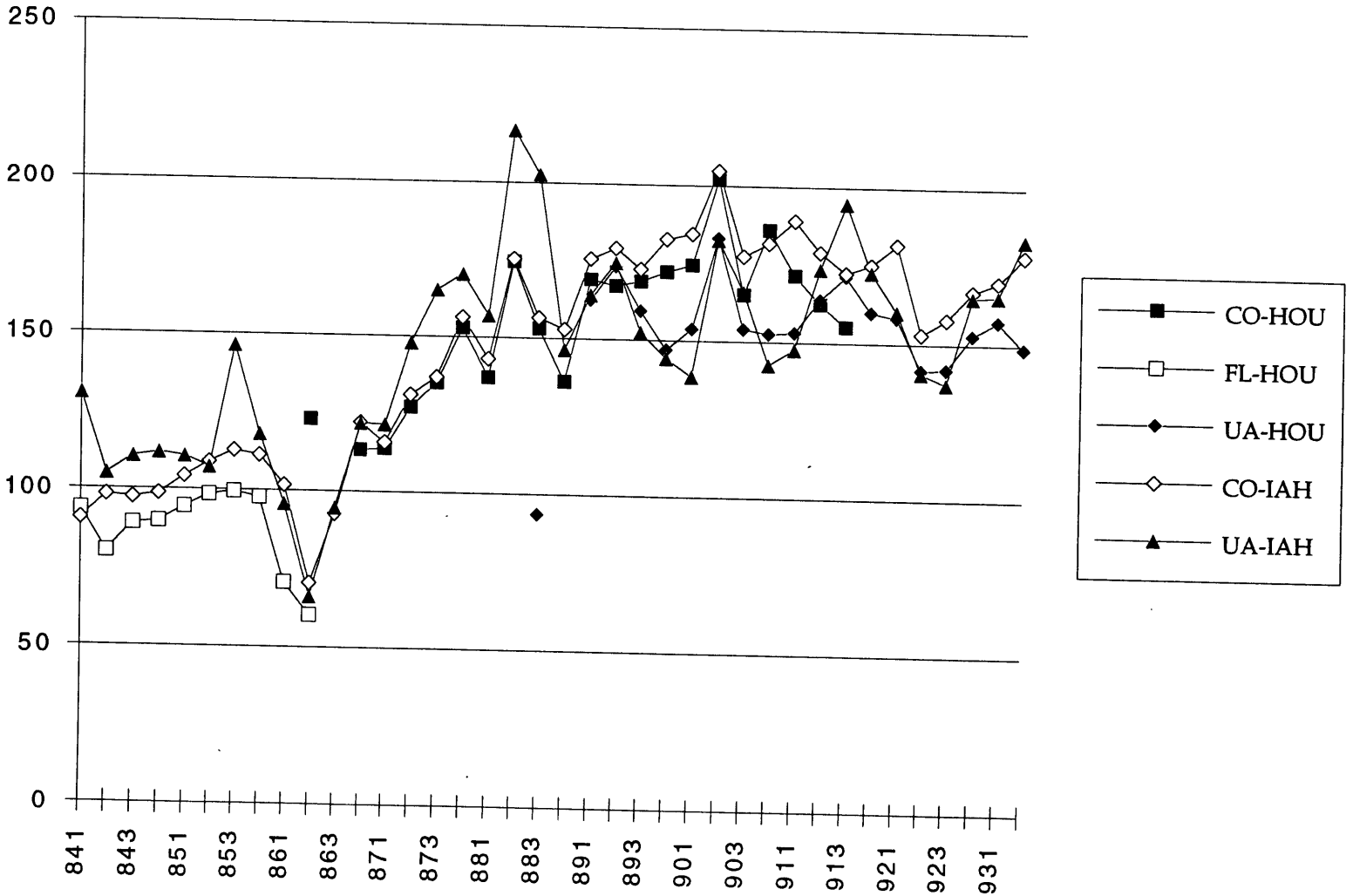


Figure 6.333 Houston-Denver: Average Number Of Departures Per Day Each Way

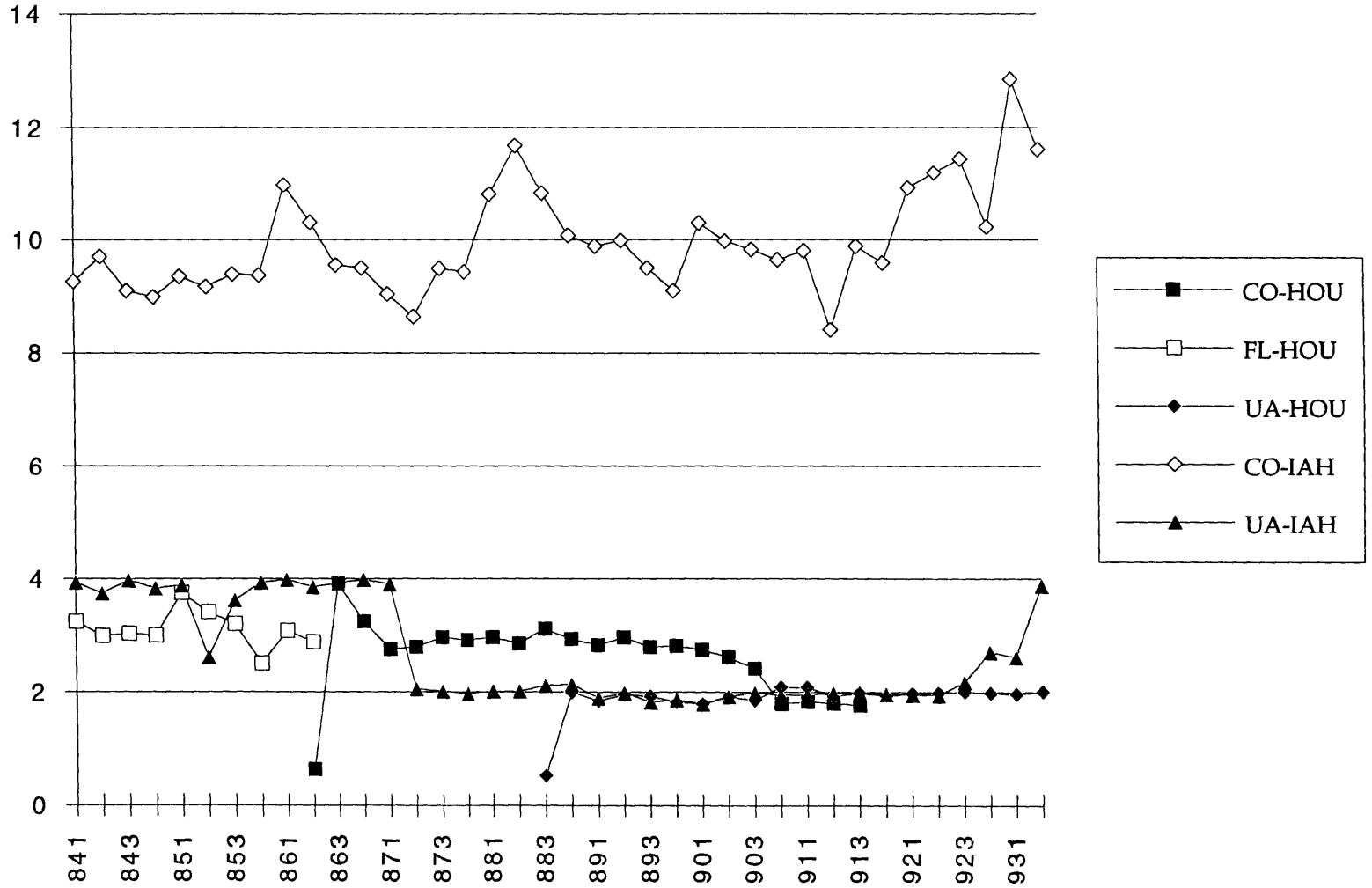


Figure 6.334 Houston-Denver: Smoothed Quarterly Non-OD Traffic

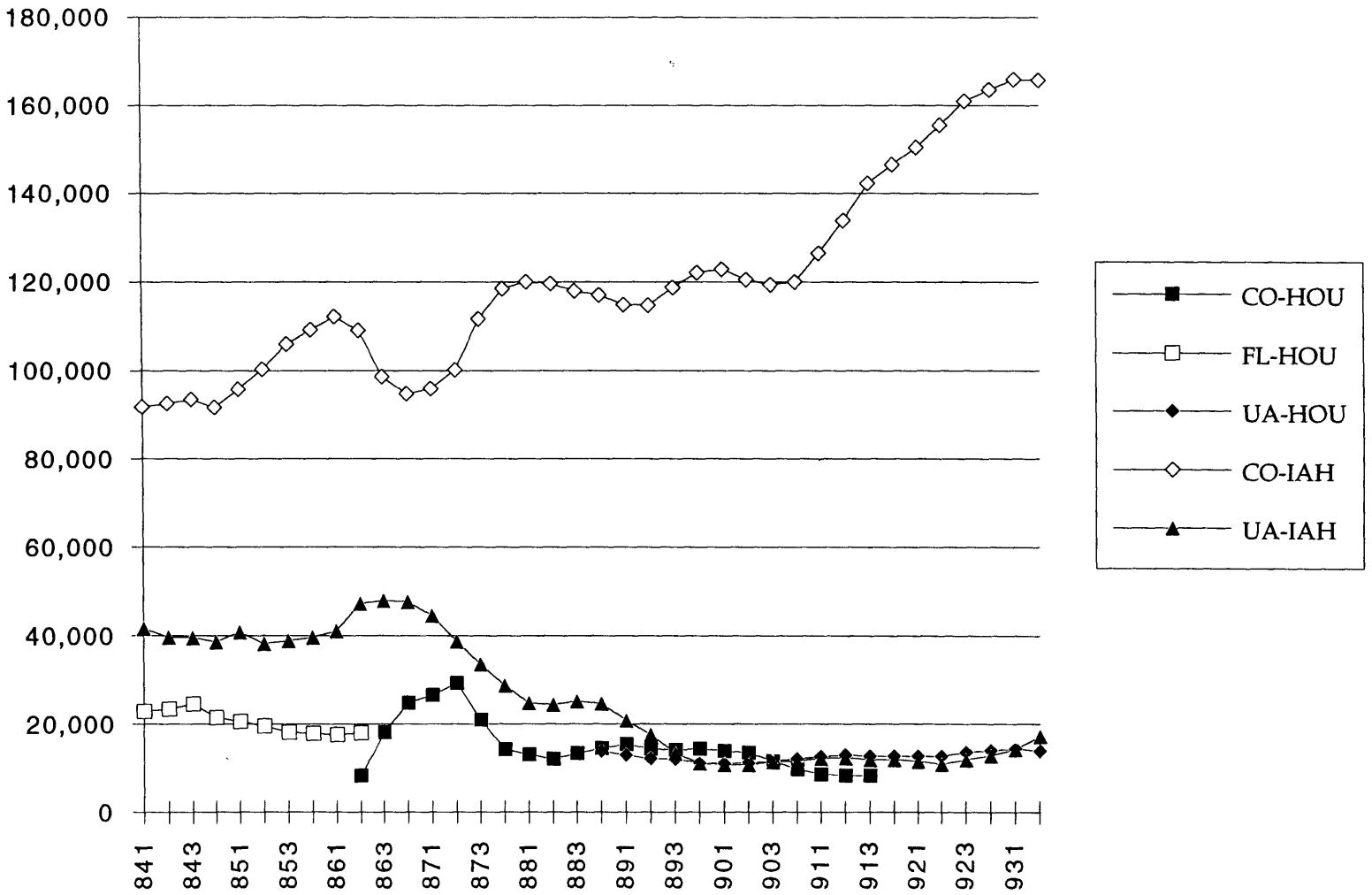


Figure 6.335 Houston-Denver: Average Quarterly Load Factor (%)

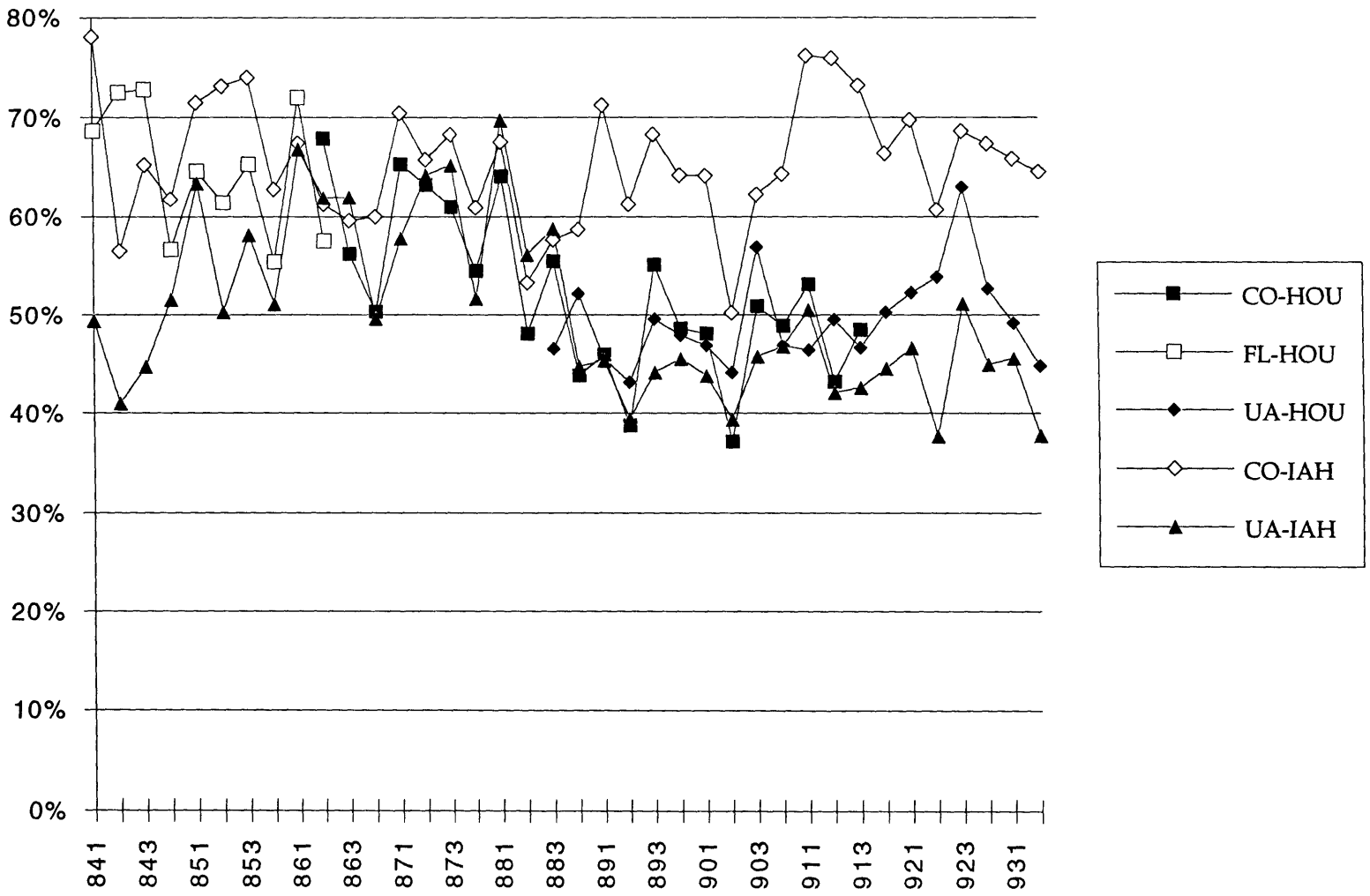
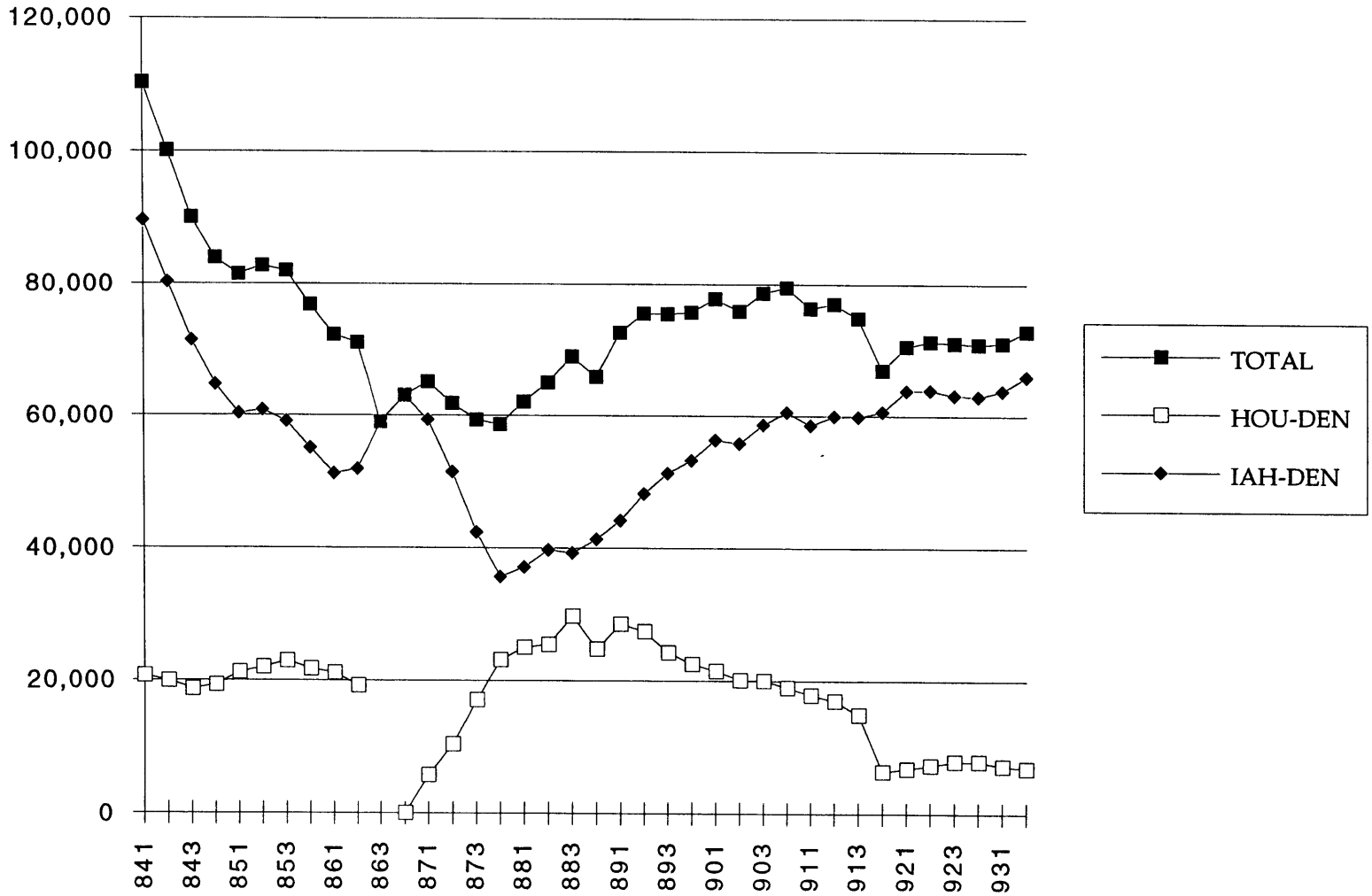


Figure 6.336 Houston-Denver: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.34 Houston-Newark (HOU/IAH-EWR, Distance = 1,422 miles)

Preliminary Remarks

The most salient observation for the Houston-Newark market is the sharp decline in total OD traffic with the disappearance of low fares once Continental acquired People's Express in 1987 (Figure 6.346). With increasing average fares over the years after 1986, total OD traffic had only reached 60,000 passengers by the second quarter of 1993 compared to the high of 140,000 in the third quarter of 1984. Nevertheless, one can infer, from Figure 6.341, that People's Express, a low-fare airline, was responsible for stimulating OD travel during the period before 1984. A word of caution, though, is that the quality of the traffic data for People's Express may be suspect because the total number of passengers People Express carried in each quarter exceeded that of what is classified as OD traffic. Consequently, non-OD traffic figures for People's Express are, at most, limited, if not, unfit for interpretation. Since the traffic figures for the other carriers are acceptable, and that the Houston-Newark market is the only other market that falls under Scenario 3 for the multiple airport city of Houston, one should not discard the Houston-Newark market so hastily. Another cautionary note is that EWR is one of the competing airports in the multiple airport system of New York City because air travelers may perceive LaGuardia and J. F. Kennedy airports as alternatives. Nevertheless, since the Houston-Newark example aims to expose the nature of competition in an environment where one airline has a dual-hub system, one could analyze the Houston-Newark market independently of the other parallel markets of Houston-LaGuardia and Houston-J. F. Kennedy. In any case, the Houston-Newark market is also of interest since Continental, the airline which had hubs at both IAH and EWR, initiated the challenge in the IAH-EWR and HOU-EWR markets.

Passengers' Response To Challengers

Prior to Continental's entry in the IAH-EWR market in the third quarter of 1984, passengers clearly favored People's Express' low fare ($80) and high frequency of service (six departures per day) over Eastern's offer of a $140 fare with only two departures per day to choose from. Accessibility may not have been a significant factor with such a distinct disparity in fares and frequency. However, by underpricing Eastern in the IAH-EWR market, Continental, which commenced challenging Eastern in the third quarter of 1984, gradually stimulated travel and attracted an increasing number of passengers as it rapidly boost frequency from three to five departures while Eastern, within the same period, reduced its frequency from two to just one departure per day, and eventually

left the IAH-EWR market by the end of the first quarter of 1987. In fact, by the time Eastern left, Continental had attracted three times the number of OD traffic as Eastern in the IAH-EWR market. People's Express, the incumbent in the parallel HOU-EWR market, suffered a serious decline in traffic shortly after Continental's entry in the IAH-EWR market, particularly when it reduced frequency at the same time when Continental was attempting to match People Express' frequency in mid-1985. Indeed, passengers seemed pleased with Continental's service to and from IAH even though fares were about $40 higher than People' Express and Eastern's. By the third quarter of 1986, when Continental and People's Express offered the same number of departures per day, OD traffic was equal; both carriers secured 60,000 passengers in that quarter (Figure 6.341). However, with People's Express abandoning service between HOU and EWR at the end of 1986 (Continental acquired People's Express), and Eastern leaving the IAH-EWR market a quarter later, Continental's monopoly on nonstop air services between Houston and Newark was a disappointment because it lost OD traffic despite increasing frequency from five to six departures by the third quarter of 1987. Passenger response increased marginally in 1988 as Continental continued to boost frequency by one departure per day and increase fares.

However, Continental, already enjoying a monopoly, ventured in the HOU-EWR market in the fourth quarter of 1988, with some signs of success since immediate stimulation of OD traffic was observed even though it offered just two departures per day (compared to six in the main IAH-EWR market) and a similar fare to that in the IAH-EWR market. Nevertheless, despite a steady stream of patronage, Continental discontinued the service after just over two years. The visible divergence of the OD traffic curves (Figure 6.341) seemed to indicate that the new service did not take away traffic from the larger IAH-EWR market, particularly when Continental added yet another departure in this established market. The growth in OD traffic beyond the second quarter of 1991 could perhaps be attributed to a normal increase in demand for travel as opposed to a switch-over from the HOU-EWR market.

Airlines' Response To Challengers

Continental's aggressive entry in the IAH-EWR market may have prompted both the Eastern and People's Expresses' departure from the respective markets of IAH-EWR HOU-EWR. While it may be a coincidence that both incumbents left around the same time, it was clear that Eastern, a decidedly small player in the IAH-EWR market, retreated almost immediately after Continental's entry. OD passengers did not show a strong preference for Eastern even though it offered a lower fare than Continental in the

same market because Eastern could only offer one nonstop departure per day while Continental, four or five. Yet, Eastern was saved by its ability to consistently attract close to 30,000 non-OD passengers per quarter, thereby allowing it to attain load factors that fluctuated between 50% and 80%. However, People's Express took its toil when it reduced frequency at the same time Continental was building its presence, so much so that by the time both carriers in the different parallel markets offered the same number of departures, People's Express' service to and from HOU became less appealing to OD passengers. With the questionable non-OD traffic data for People's Express, one may only conclude, by examining the average load factors, that People's Express did fill its planes reasonably well since load factors seemed to be averaging 60%.

In short, Continental's success in the IAH-EWR market is largely attributed to its determination to be the major player in the IAH-EWR market, particularly when it had a vested interest in its two hubs at IAH and EWR, and that with the exit of Eastern and People's Express in the first quarter of 1987, it became the only airline offering frequent nonstop service between the two airports until the third quarter of 1988. Indeed, despite steadily increasing frequency over the years and contending with only a moderate growth in OD traffic, Continental was consistently able to maintain average load factors that were in the vicinity of 70% since it lured an increasingly large number of non-OD traffic as well. In fact, non-OD traffic grew from a few thousands per quarter in 1984 to just over 100,000 per quarter by 1993, a phenomenal growth which can only be possible because of its strong hub network at both IAH and EWR. Clearly, as it devoted less attention and resources to its service between HOU and EWR, and because it did not have a strong hub at HOU, Continental could only attain average load factors between 40% and 60% in the smaller HOU-EWR market. Since non-OD traffic did not exceed the OD traffic in the HOU-EWR market, Continental may have finally decided to abandon the HOU-EWR market because both OD and non-OD passengers were not responding as favorably to its offer of flights to and from a more accessible airport at a lower frequency.

Concluding Remarks

A glance at Figure 6.346 reveals that total OD traffic in the Houston-Newark market as a whole declined precipitously with the exit of People's Express' service between HOU-EWR. While a cross-check with the average fare profile (Figure 6.342) may lead one to infer that the stimulative effects of the low fare came to an abrupt end with the exit of People's Express, one should also hesitate making any specific conclusions because data for People's Express may be flawed. Nevertheless,

Continental's self-challenge in the HOU-EWR market did, at least initially, stimulate travel since Figure 6.346 indicates that there was a sudden jump in OD traffic in the fourth quarter of 1988. However, one could postulate that the stagnant OD traffic figures in the Houston-Newark market after 1988 could be explained by the more than doubling of fares from $100 to $250 after the exit of low-fare carrier, People's Express, at the end of 1986. With high fares, efforts to stimulate air travel between the two cities that are 1,422 miles apart could well be thwarted.

Figure 6.341 Houston-Newark: Smoothed Quarterly OD Traffic

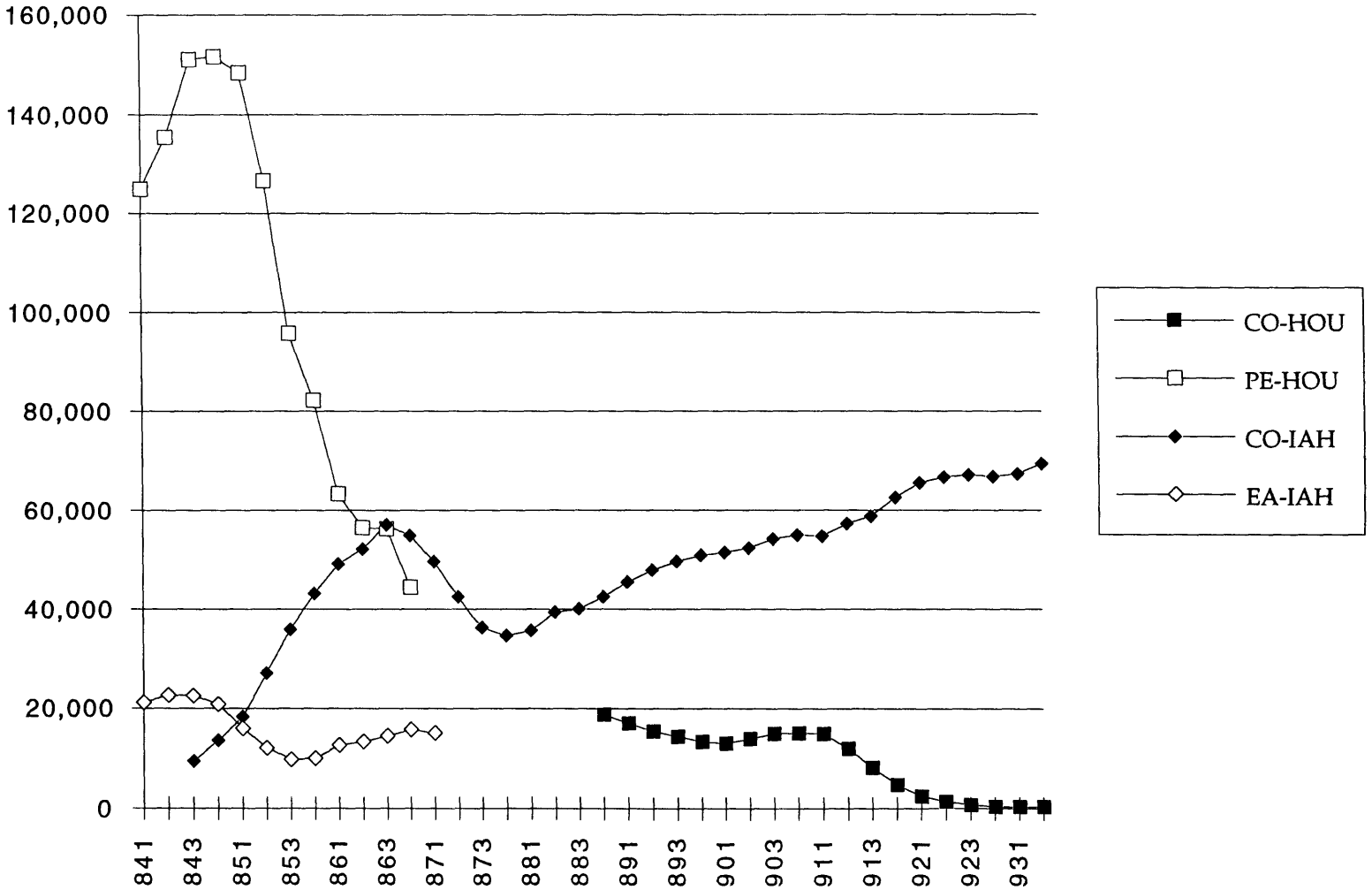


Figure 6.342 Houston-Newark: Average One-Way Fare ($)

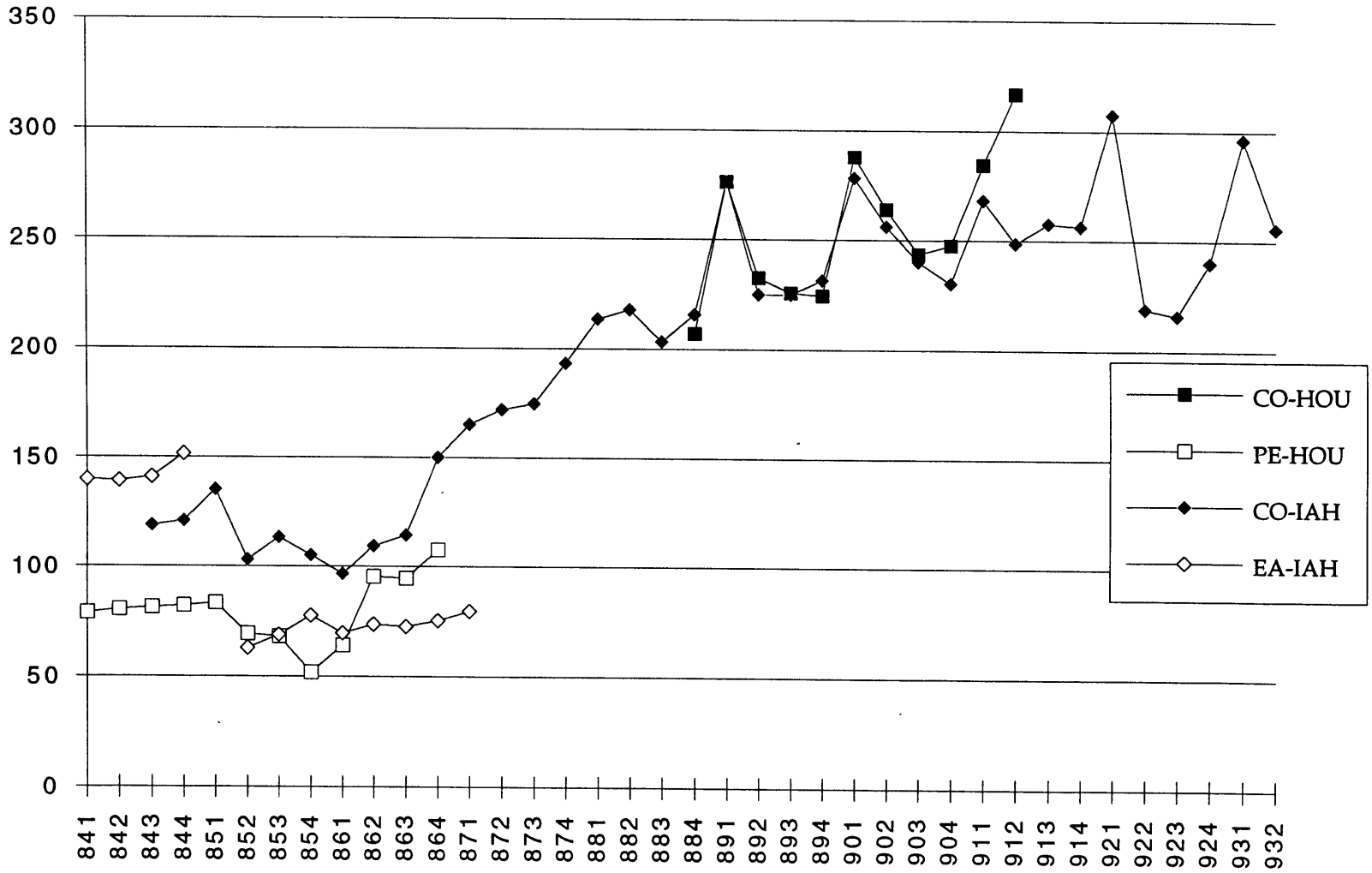


Figure 6.343 Houston-Newark: Average Number Of Departures Per Day Each Way

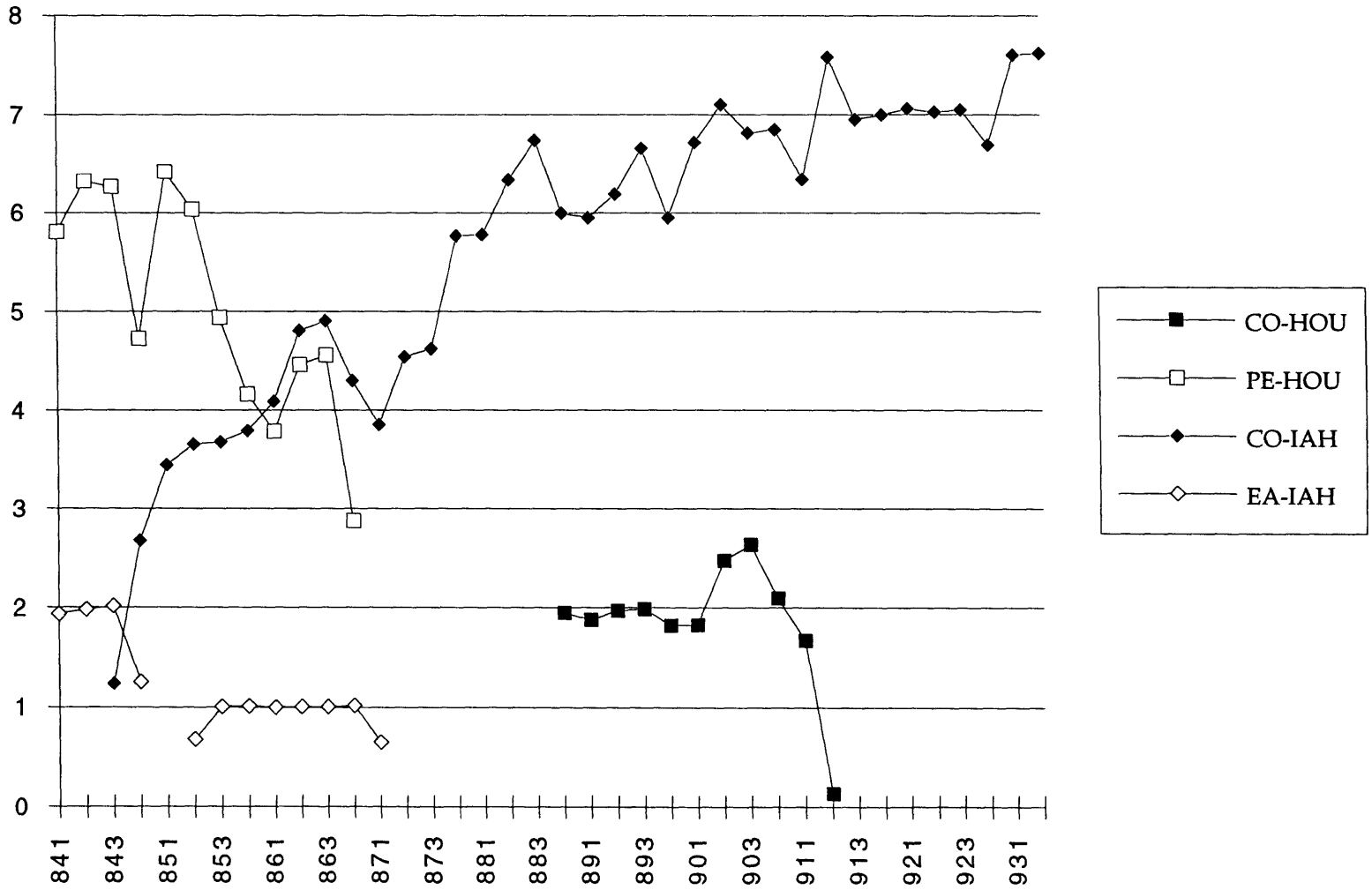


Figure 6.344 Houston-Newark: Smoothed Quarterly Non-OD Traffic

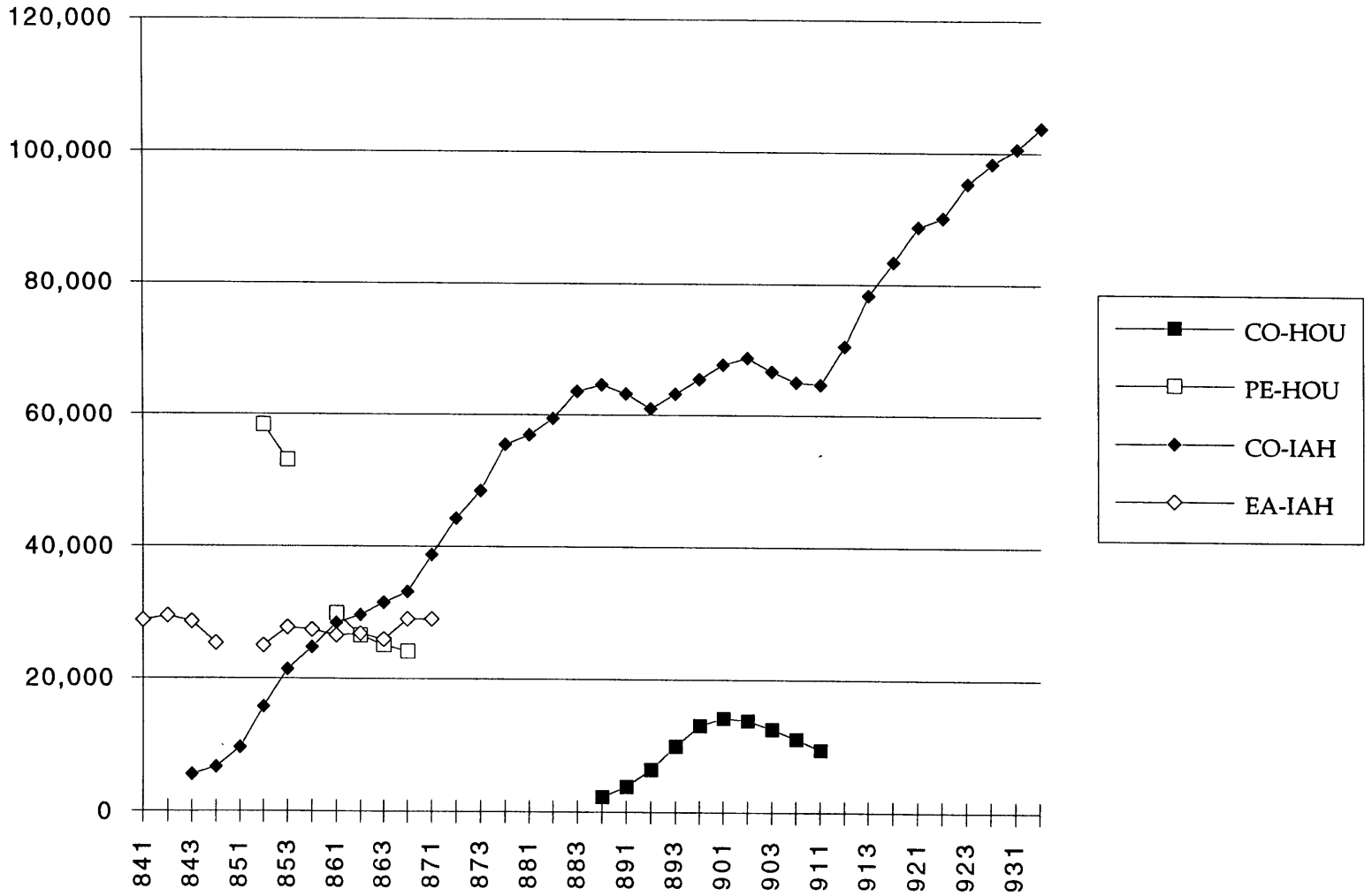


Figure 6.345 Houston-Newark: Average Quarterly Load Factor (%)

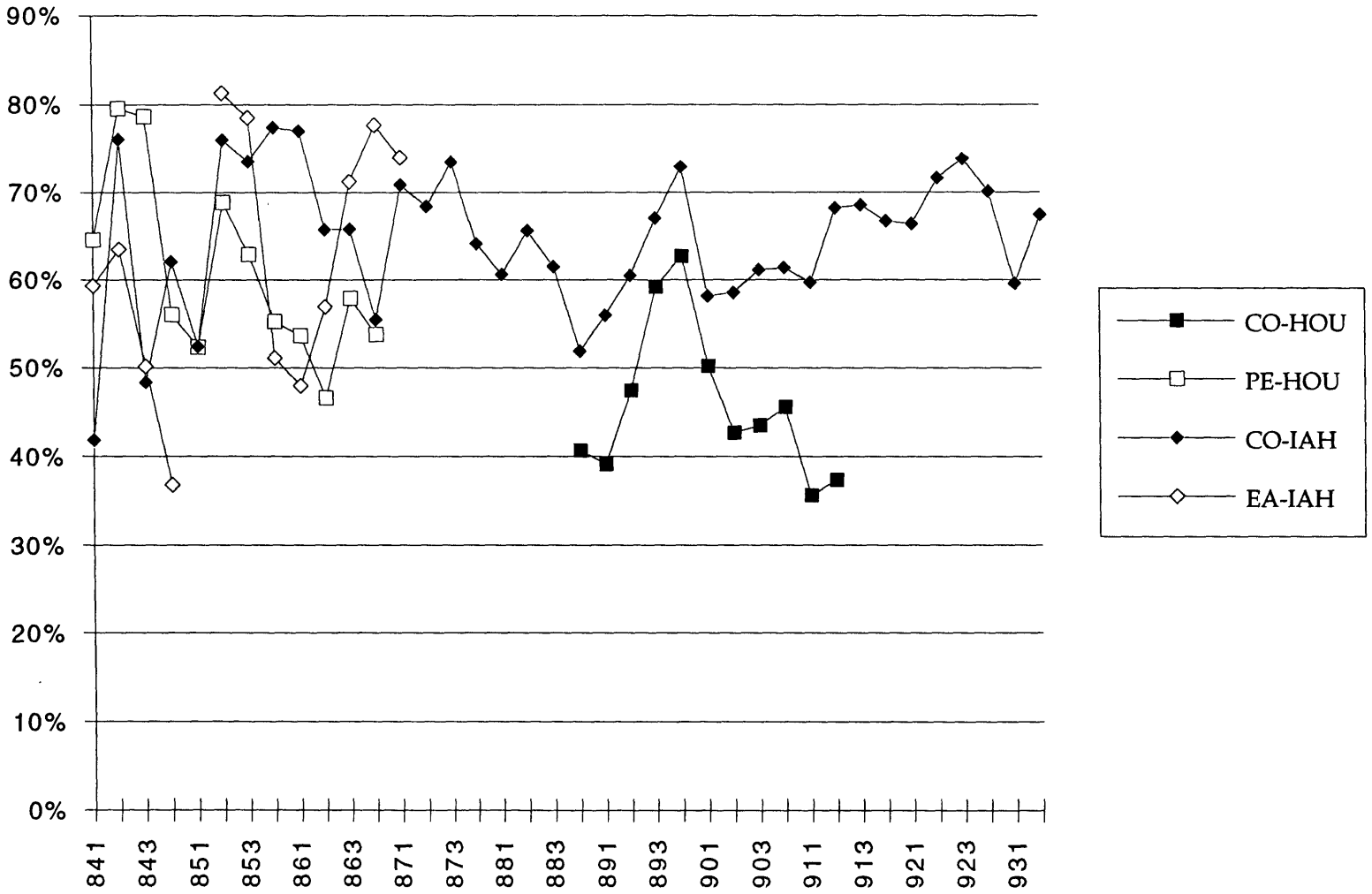
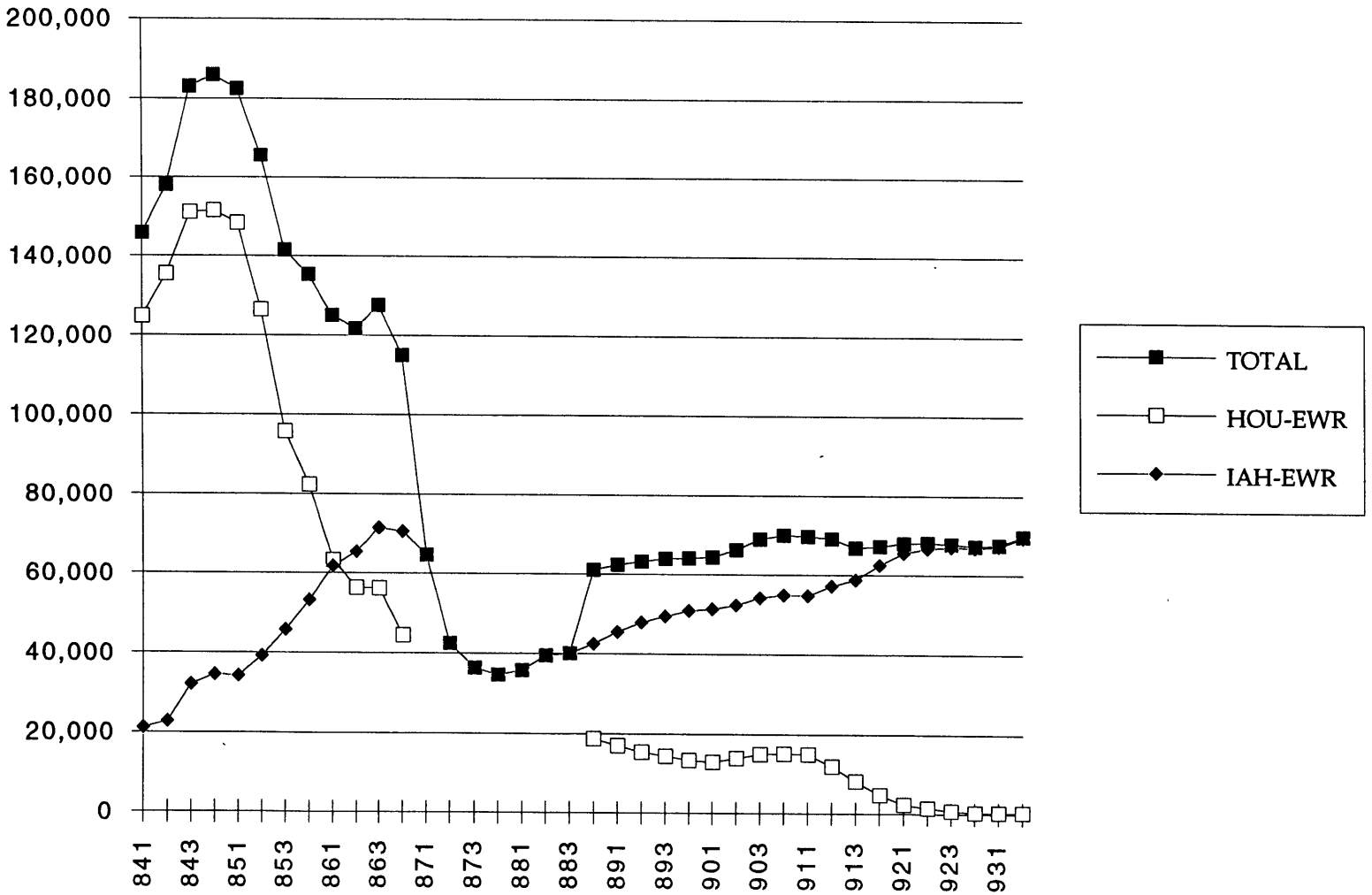


Figure 6.346 Houston-Newark: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.41 Chicago-Detroit (MDW/ORD-DET/DTW, Distance = 238 miles)

Preliminary Remarks

The Chicago-Detroit market is characterized by both a large volume of OD traffic as well as intense rivalry. A total of seven airlines plied the three parallel markets of MDW-DET, MDW-DTW, and ORD-DTW. Further, given that there were six challenges and different market leaders within a span of just 10 years, one could use the busy Chicago-Detroit market as an excellent example for analyzing the nature of competition between airlines operating between two multiple airport cities. The erratic total OD figures - the total OD traffic surged between 1987 and 1990 but declined thereafter - provide some insight to the dynamic nature of the way air travelers respond to the myriad of air services available between the two cities that are actually within driving distance.

Passengers' Response To Challengers

Prior to Republic's entry in the already heavily contested ORD-DTW market in the fourth quarter of 1984, passengers were already showing a distinct preference for Midway's service between MDW and DTW over United, American and Northwest's service between ORD and DTW. Although Midway offered only two departures per day, American and United five and six respectively, and Northwest, only one or two, Midway may have had a fare advantage over its rivals at ORD (Figure 6.412), on top of offering a service to and from the more accessible airport of MDW. The entry of Republic in the fourth quarter of 1984 did pose a threat to the incumbents in the ORD-DTW market (United, American, and Northwest) because although Republic matched United and American's higher fares, it was able to secure an increasing number of OD passengers by boosting the number of departures from five to eleven per day by the fourth quarter after its entry. With its superior, unmatched frequency of 11 departures a day - United and American only offered six, and Northwest three - Republic did lure up to 60,000 passengers during the last quarter of its operations in the ORD-DTW market, this figure being twice of what American and United captured in that same quarter. Patronage of Midway's service between MDW and DTW was not adversely affected during Republic's reign, particularly when Midway increased the number of departures to seven after Republic's entry.

The entry of Jet America in the ORD-DTW market the quarter after Republic's entry was a successful venture in that by matching Northwest's frequency and offering the lowest fare in the entire market, Jet America lured its sizable share of passengers

once it established itself in the market (Figure 6.411) and announced to the traveling public that it was a cheaper alternative to United, American and Northwest. As though the markets were independent, OD traffic in the MDW-DTW market was barely affected by the challenge initiated by Republic and Jet America. However, between the second quarter of 1986 and the second quarter of 1987, Northwest, which had taken over Republic's operations and offered 10 to 12 flights per day, achieved a huge increase in OD traffic in its services between ORD and DTW at the expense of Midway's service between MDW and DTW. Northwest's sudden act of aggression did not seem to greatly affect United and American, both of which merely maintained their six and five departures respectively during the year. However, Jet America, despite offering the lowest fares, had become a less attractive alternative for passengers, particularly when it continued to offer only two departures per day. Apart from boosting frequency in the ORD-DTW market, Northwest, in the second quarter of 1986, also initiated service between MDW and DTW, thereby breaking the monopoly that Midway enjoyed for a few years. Yet, Northwest's half-hearted enroachment of Midway's territory with just two or four flights per day was quite remarkable since the service attracted just as many OD passengers as its other service between ORD and DTW. However, since the larger number of departures to and from ORD lured the crowds, Northwest suspended service between MDW and DTW at the end of 1986, after just three quarters of operations in that market.

Captivated by Midway's success in the MDW-DTW market - Midway had been the leader in OD market share since 1984 - Southwest challenged Midway in the second quarter of 1987 by offering a fare that was $30 lower than Midway's and matching Midway's frequency of 11 departures per day each way. Although Jet America left the ORD-DTW market the quarter after Southwest's entry, all remaining carriers had, without exception, achieved significant increases in OD traffic. A highly probable reason for the incentive to fly is that Southwest led the way in determining the market's fare of $40, a fare which all carriers matched by the first quarter of 1988. Thus, regardless of frequency and accessibility concerns, every airline operating between Chicago and Detroit benefited from Southwest's entry. Specifically, the sharpest gains in OD traffic were found in the MDW-DTW market, whereby the OD traffic curves for Midway and Southwest moved in tandem between the second quarter of 1987 and the fourth quarter of 1988. United, even without having to boost frequency, attracted a large pool of passengers as well (Figure 6.411).

Prompted by its success in the MDW-DTW market, Southwest created yet another demand for travel by initiating service between the two downtown-airports of

MDW and DET, a service which immediately attracted about 75,000 passengers in the first quarter of operations (Figure 6.411). An almost immediate switch in preference was observed as Southwest' s MDW-DTW service gradually lost its appeal because the MDW-DET service continued to attract about 80,000 passengers per quarter even though Southwest offered two departures fewer in the MDW-DET market than in the MDW-DTW market. While Southwest's creation of the new market did not adversely affect Northwest, United and American's service in the ORD-DTW market, Midway might not have been spared because it lost just over 1,000 OD passengers the moment Southwest inaugurated service between MDW and DET. In fact, Midway continued to suffer slight losses over the ensuing quarters until its exit at the end of 1991.

Northwest's re-entry in the MDW-DTW market in the second quarter of 1989 with three departures per day was more successful than before; it secured a reasonable share of OD passengers even though it had to contend with two other more aggressive rivals in the same market - Southwest and Midway - both of which offered more departures per day. A slight decline in OD traffic was observed when Northwest reduced frequency in the ORD-DTW market by two departures in early 1990. However, after Midway's exit at the end of 1991, all carriers, except American and United, achieved significant gains in OD traffic. Specifically, Northwest's gain in OD traffic in the MDW-DTW market could, in part, be attributed to its decision to increase frequency to six departures per day to match Southwest. Given that United, American, Northwest (MDW-DTW) and Southwest (MDW-DTW) were essentially offering the same number of departures per day (five or six) and fares, and that United and American were losing OD traffic while Southwest and Northwest were gaining OD traffic, one could speculate that accessibility was a contributing reason for the disparity in OD traffic share. Northwest's service between ORD and DTW was not affected since it was clearly saved by the highest frequency in that market. Southwest's service between MDW and DET was just as popular, not only because passengers could choose from seven departures per day, but perhaps the MDW-DET service was a very enticing alternative for certain residents of the Detroit metropolitan area. In short, passengers were choosing on the basis of frequency and accessibility when considering air travel between Chicago and Detroit.

Airlines' Response To Challengers

The cluttered chart showing the number of departures per day (Figure 6.413) gives the impression that competition in the Chicago-Detroit market was intense. In reality, some airlines did respond quickly to the changing environment while others did

not. For example, American, United and Jet America were passive players since they barely altered their frequency of service radically despite the entry of challengers in the same or parallel markets. United and American, both of which had hubs at ORD, did not have to worry too much about their share of OD traffic because they were both leaders in non-OD traffic, which therefore allowed them to maintain relatively high load factors that averaged around 60%. Then, for being a minor player who tried to survive by offering the lowest fare, Jet America, which secured comparatively fewer non-OD passengers than OD passengers, merely achieved average load factors that fluctuated between the upper 30s and the 50s.

Of the remaining active participants in the market - Midway, Republic (later Northwest), Northwest, and Southwest - Northwest, which had a hub at DTW, followed by Southwest, were perhaps the most aggressive in fighting for their share in the Chicago-Detroit market because these two carriers had offered service in two parallel markets. Midway, which before 1989, secured the largest share of OD traffic in the Chicago-Detroit market by offering service between MDW and DTW, captured a pool of non-OD traffic that was only a quarter of the size of the OD traffic. Given the small number of spokes emanating from its hub at MDW, Midway, with its mix of OD and non-OD passengers, was still well able to achieve load factors that averaged around the mid-50s prior to 1988 and just above 60% thereafter (despite the fact that it had altered frequency on several occasions). Although Midway's success in the MDW-DTW attracted the attention of Northwest and Southwest, Southwest posed a genuine threat to Midway because Southwest entered the market with a lower fare and matched Midway's frequency immediately. While Midway clung to its title as the champion of the MDW-DTW market in terms of OD traffic throughout the years it offered the service, one could say that Southwest and Northwest both had to divide their attention between two markets since they both gave passengers a choice of airports at either Chicago or Detroit. While Northwest's service between ORD and DTW was less successful before 1987 in that OD traffic was only just as large as the non-OD traffic, and that average load factors were generally low (averaging 40%), the acquisition of Republic and the significant boost in frequency in late 1986 did bring about sharp increases in both OD and non-OD traffic. In fact, in the post 1988 years, OD traffic continued to increase while non-OD traffic stagnated, but Northwest's services became highly viable since average load factors were then consistently in excess of 60%. By devoting fewer resources to its service between MDW and DTW, Northwest realized that its first challenge in 1986 was a failure because it had to contend with load factors that were appallingly low (30%). This may have influenced Northwest's decision to withdraw

service between MDW and DTW. However, the resumption of the service in 1989, with the same number of departures, did attract more OD and non-OD passengers, and average load factors were off with a moderately cheerful start (the mid-40s). With the exit of Midway, which resulted in an increase in OD traffic for Northwest, Northwest did not have to question the viability of the service between MDW and DTW since average load factors jumped by 10% despite a doubling of the frequency from three to six departures.

Southwest's service had rather mixed results in that, although it offered a fairly large number of departures per day - typically eight or nine (Figure 6.413) - compared to its rivals, it was never the leader in OD or non-OD market share. However, even though it did not have as established a hub as United or Northwest at either Chicago or Detroit, Southwest managed to capture more non-OD traffic than Northwest. Yet, with so many flights per day, Southwest achieved a 'U'-shaped average load factor profile for the MDW-DTW market (Figure 6.415) because of the sharp decline in OD traffic after it challenged itself by offering service between MDW and DET. Indeed, average load factors plunged from the 60s to as low as the 30s, but with the exit of Midway, the service between MDW and DTW became viable again because load factors soared to around 70% by mid-1993. Southwest's monopoly service between MDW and DET attracted significantly more OD than non-OD traffic, but for the frequency it was offering, average load factors were dismal (low 40s). Signs of improvement were later seen when non-OD traffic gained momentum and that the service became quite popular after Midway's exit; a jump of 20% in average load factors was perhaps most encouraging for Southwest as it continued to offer services between MDW and DET.

Concluding Remarks

All in all, one could infer, from the huge hump in Figure 6.416 , that stimulation in OD traffic is associated with the entry of Southwest, the airline which brought low fares into the Chicago-Detroit market. However, low fares aside, the cross-overs in the total OD curves in Figure 6.416 provide evidence that competition between the airports was evident, and that the way the airlines served the multiple airport cities did influence air travelers' choice of airports. Clearly, passengers displayed a propensity to go to airports that offered the most number of departures, particularly for flights of such a short duration. The differences in frequency in each parallel market do reflect the way airlines allocated their resources. In any case, in terms of the size of OD traffic, the ORD-DTW market was the largest while MDW-DET, the smallest.

Figure 6.413 Chicago-Detroit: Average Number Of Departures Per Day Each Way

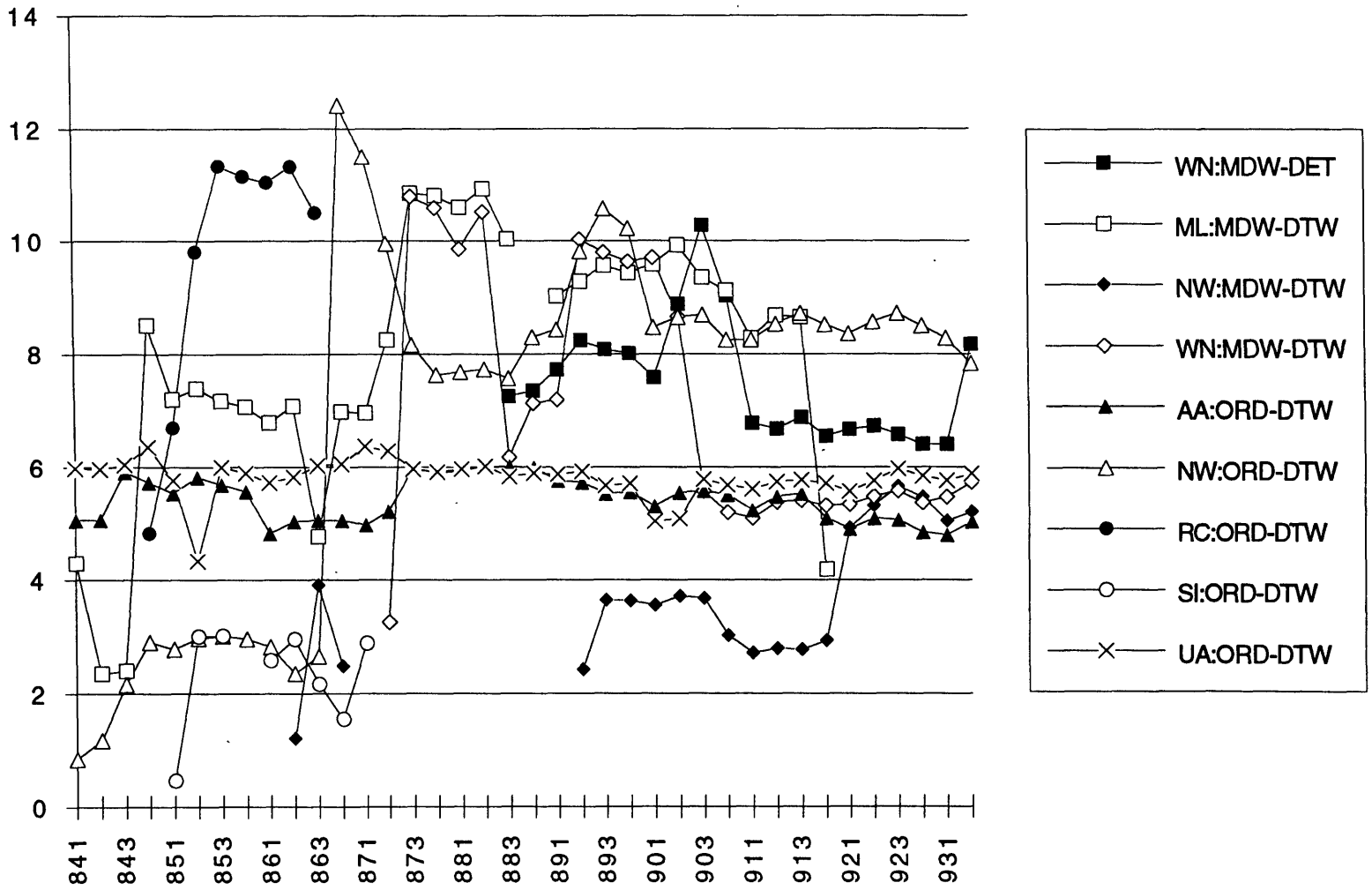


Figure 6.414 Chicago-Detroit: Smoothed Quarterly Non-OD Traffic

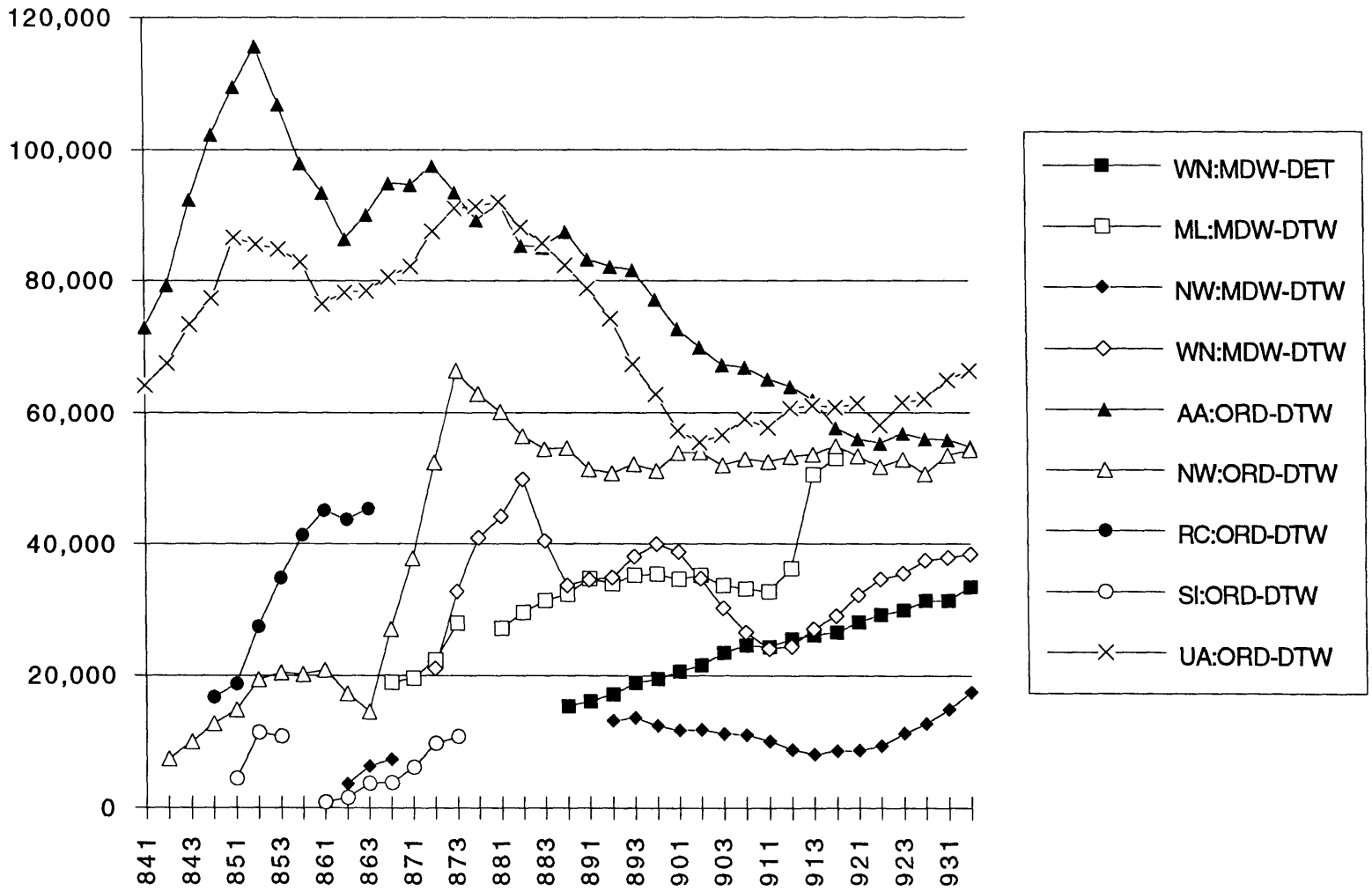


Figure 6.415 Chicago-Detroit: Average Quarterly Load Factor (%)

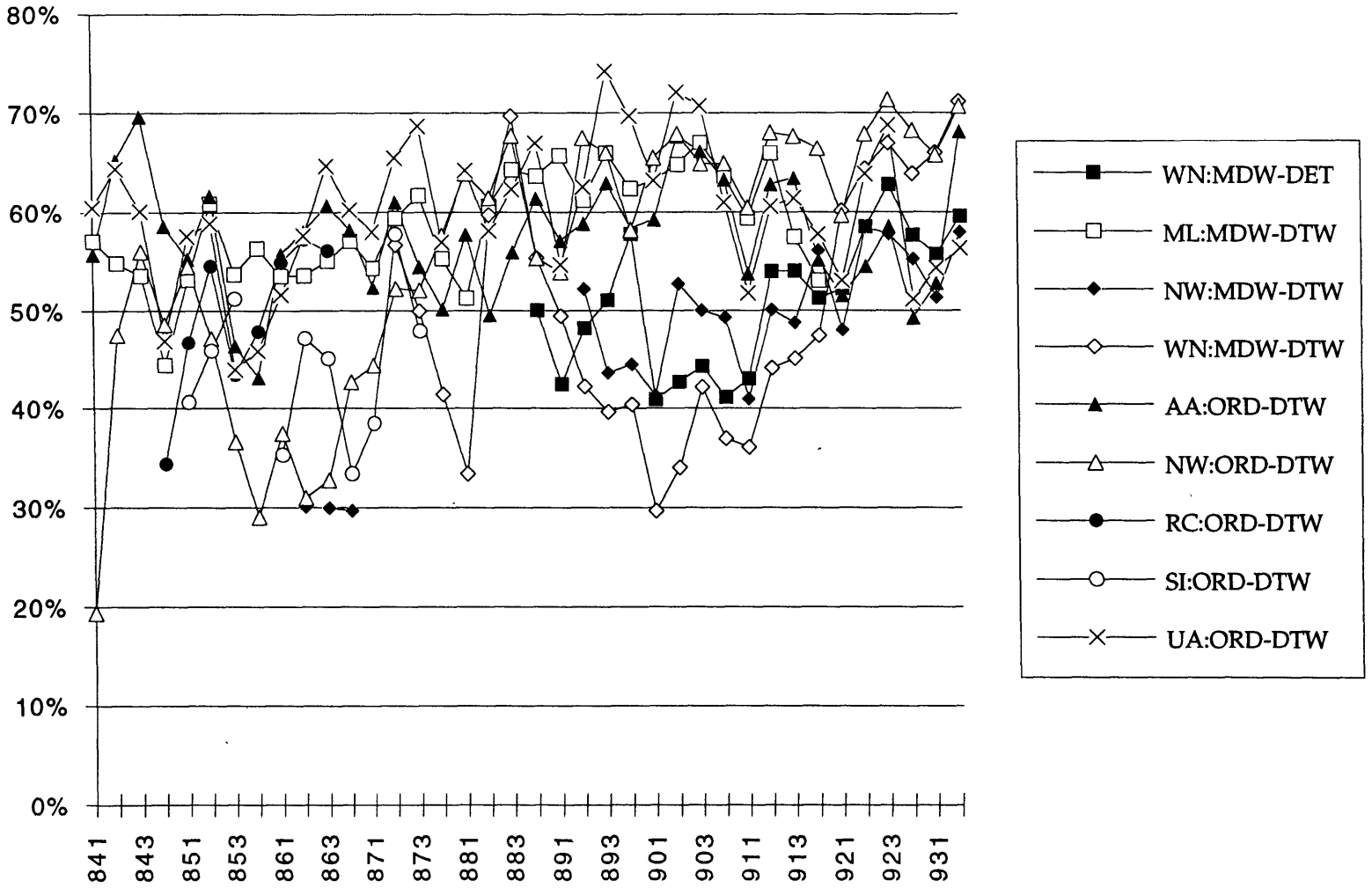
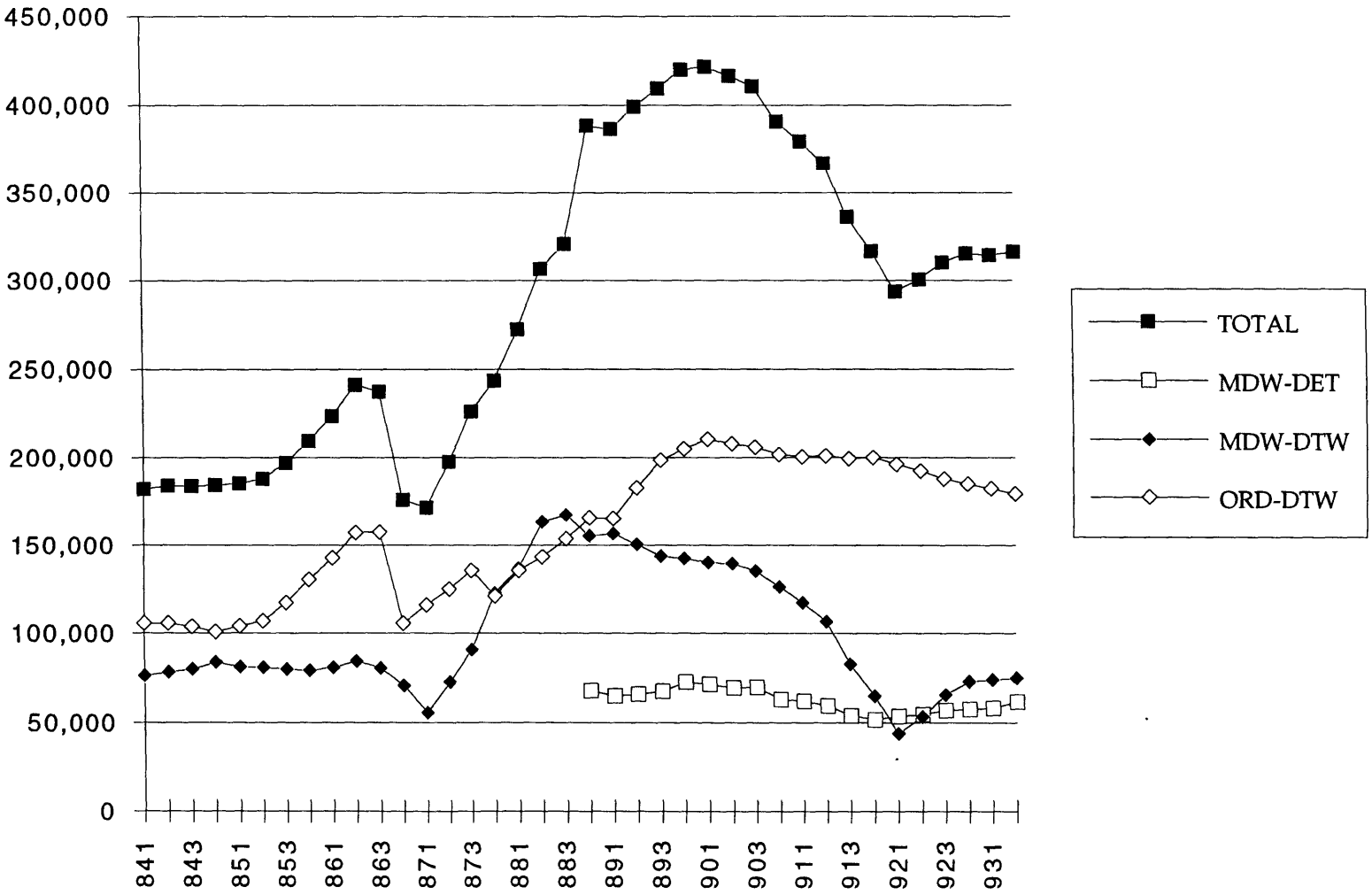


Figure 6.416 Chicago-Detroit: Smoothed Quarterly Total Airport-To-Airport OD Traffic



6.42 Scenario 4: Houston-Dallas (HOU/IAH-DAL/DFW, Distance = 232 miles)

Preliminary Remarks

Compared to the Chicago-Detroit market, the Houston-Dallas market seems lackluster in spite of the fact that there are actually four parallel markets and five airlines offering services between Houston and Dallas. Continental was the only challenger, but its entry did not provoke the incumbents, all of which seemed wholly complacent with their own niche. However, in analyzing competition in the Houston-Dallas market, one inevitably has to give much attention to Southwest because Southwest was responsible for providing service in the most popular market: the HOU-DAL market. Like the previous case, Houston and Dallas host airports that are hubs for some carriers: DFW is American's hub, and to a lesser extent, Delta's (compare this with United and American in ORD); IAH is Continental's hub (compare this with Northwest's hub at DTW); and Southwest has a major presence in DAL and HOU. However, one can see, from Figure 6.421, that, unlike the Chicago-Detroit market, competition in the Houston-Dallas market may have already subsided.

Passengers' Response To Challengers

Prior to the entry of Continental in the IAH-DFW market in the third quarter of 1984, the majority of air travelers, faced with similar fares, were choosing to fly between the two more accessible airports of HOU and DAL. The unusual observation is that despite a difference of 10 departures per day, passengers were essentially indifferent between Muse Air and Southwest when flying between HOU and DAL. Indeed, with the exception of Muse Air, which was eventually acquired by Southwest in June 1985 [52], none of the competitors in the other airport-pair markets came close to Southwest in terms of volume of OD traffic. Even Southwest's offer of seven departures per day each way between IAH and DAL was significantly less attractive (Figure 6.421).

Southwest's direct competitor in the well-guarded HOU-DAL market in the early 80s was Muse Air, an airline founded in 1981 by Lamar and his son, Michael Muse, both of whom left Southwest in 1978. By setting up their own airline, they aimed to break Southwest's monopoly on the HOU-DAL route, but was "never really successful in doing so in the end." [52] Besides finally breaking the lucrative monopoly that Southwest enjoyed, Muse Air reasoned that since the Houston-Dallas market was huge and fast-growing, there should be room for two airlines with two different types of service and fare structures, particularly because load factors on Southwest's flights were typically high. Thus, Muse Air started by offering a "quality product" [53] to distinguish itself

from Southwest. Specifically, Muse Air offered non-smoking flights and assigned seating. In fact, since each flight must be 80% full before any one passenger must take the center-seat, Muse Air's policy was that those passengers who were required to take the center-seats were consoled with a free bottle of champagne [54]. Further, unlike Southwest, which enforced a quick 10-minute turnaround for its planes, Muse Air scheduled its planes for a longer turnaround so that passengers could settle in their seats comfortably before the plane pushed-back. Yet, by the 90s, a time when Muse Air was already fully absorbed by Southwest, Southwest did not really have to worry about price retaliation from its competitors because of its distinctly superior frequency advantage. Nevertheless, with the gradual reduction in frequency, Muse Air's service became increasingly less appealing to OD passengers as Muse Air entered its phase of withdrawal. However, as though it wanted to compensate for the loss of service between HOU and DAL as a result of Muse Air's exit, Southwest' s strategy of boosting the number of departures from 21 to 30 in the last two quarters before Muse Air's exit paid-off handsomely because passengers responded favorably as can be seen by the sharp increase in OD traffic from 200,000 in the second quarter of 1987 to just over 300,000 passengers in the second quarter of 1990.

The entry of Continental in the IAH-DFW market did little to annoy the other four incumbents, all of which more or less occupied their own niche. Within the IAH-DFW market alone, one notices that American, which maintained its frequency of eight departures per day until the second quarter of 1986, was already carrying more then twice the number of OD passengers as Continental even though Continental, which launched the service with only five departures per day, eventually matched American's frequency by the third quarter of 1985. By adding one more departure in the third quarter of 1986, and two departures two years later, American was able to lure an increasing pool of OD passengers within these two years. An interesting observation is that while American's other service between HOU and DFW was very unpopular during the earlier quarters despite its efforts at equalizing the frequency in both markets, passengers were observed to be switching-over to the HOU-DFW services beginning in mid-1988, so much so that by the second quarter of 1989, passengers were practically indifferent between either service. In fact, after the second quarter of 1989, passengers preferred the service between HOU and DFW even though there was one departure less in this market. With American offering similar fares in both markets, passenger were most likely choosing on the basis of accessibility. In the IAH-DFW market alone, only Continental came close to American in terms of market share when Continental matched

American's frequency in 1990; otherwise, Continental, which offered one or two departures less than American, was the less preferred alternative.

Continental's other rival in the IAH-DFW market was Delta, an airline that, in most quarters, offered one departure less than Continental, but secured more passengers than Continental until the first quarter of 1988, after which a clear reversal of preference was observed. By competing with itself, Delta's service between HOU and DFW attracted fewer passengers when it offered two or three departures fewer than that between IAH and DFW. However, passenger preference for the HOU-DFW services was enhanced even though Delta had equalized the frequency in both market only between the second quarter of 1988 and the first quarter of 1989. Thus, like the OD traffic curves for American, the intersections of the OD traffic curves for the two parallel markets of HOU-DFW and IAH-DFW for Delta indicate that passengers are sensitive to the frequency of service.

Finally, the fact that Southwest reduced the number of departures from seven to five in the monopoly market of IAH-DAL but continued to attract a stable share of OD traffic perhaps indicates that passengers' preference for this service was quite independent of available alternatives. In particular, as this pool of passengers did not even consider the thirty departures per day between HOU and DAL as substitutes, one could say that the IAH-DAL service may appeal to a specific group of travelers who insist on using these two airports for one reason or another.

Airlines' Response To Challengers

As mentioned earlier, the Houston-Dallas market lacks the level of activity as observed in the Chicago-Detroit market. However, the average load factors (Figure 6.425), which range between 40% and 80%, indicate that the airlines may have made reasonable decisions with regard to the supply of services in each of the four parallel markets. Further, the fact that the airlines in the Houston-Dallas market had hubs at one of the four airports means that a certain level of support is provided by the presence of a pool of non-OD traffic. For example, Southwest, which has sizable operations at DAL and HOU, captured, almost in all quarters, the largest number of non-OD passengers - in the vicinity of 150,000 passengers per quarter. Most impressive of all, Southwest was consistently able to achieve average load factors that were in the 60s with its supply of between 21 and 30 departures per day each way. On the other hand, Muse Air, Southwest's direct competitor in the HOU-DAL market that offered 15 or fewer departures and had a smaller pool of non-OD passengers because of its weaker route network, had to contend with ailing average load factors that barely exceeded 60%.

However, given that Southwest does not have extensive operations at IAH and that it offered significantly fewer departures - between five and nine per day - in the IAH-DAL market, Southwest could only sustain average load factors between 40% and 60% in the smaller IAH-DAL market.

American, which offered about four departures more than Delta in both IAH-DFW and HOU-DFW markets, and had a stronger hub at DFW than Delta, consistently captured more non-OD traffic than Delta. In fact, since Figure 6.244 reveals that American was better able to tap the non-OD traffic than the OD traffic, one may conclude that it did not have to match Southwest's high frequency service between DAL and HOU, a service which primarily aimed at the OD travelers. With the immense support of the non-OD traffic, American's service between HOU and DFW enjoyed excellent average load factors that were as high as the 70s before 1988 and at least 60% then after. Even with more departures, American's service between IAH and DFW, which did not seem quite a popular as the service between HOU and DFW until after 1988, could only boast of an average load factor that was mainly in the 50s most of the time.

By offering two or three more departures in the IAH-DFW market, Delta's service between IAH and DFW did capture more non-OD passengers than the services between HOU and DFW, but average load factors in the IAH-DFW were generally a few percentage points lower than those for the HOU-DFW market. However, relative to American, Delta was, on the whole, less successful whether measured in terms of OD traffic, non-OD traffic, or average load factors. Yet, Delta saw justification for maintaining its service between the two cities even though load factors fluctuated between 40% and 60%, perhaps because Houston was still an important spoke emanating from its hub at DFW.

Lastly, Continental's challenge in the IAH-DFW market was considered successful in that by exploiting its very southerly hub at IAH, it was well able to capture a large pool of non-OD traffic that was usually at least thrice the size of its OD traffic. With average load factors that were typically in the mid-50s, Continental could say that its service between IAH and DFW was viable. In fact, Continental achieved about the same average load factors as American, and consistently higher average load factors than Delta in the same IAH-DFW market. The obvious difference, though, is that Continental did not offer its passengers a choice of airports in the Houston area, whereas American and Delta were able to do so.

Concluding Remarks

With the exception of the HOU-DFW market, one can see, from Figure 6.246, that total OD traffic was generally quite stable over the years examined. It is clear that OD traffic was primarily between HOU and DAL, with IAH-DFW being the runner-up. Initially, total OD traffic in the IAH-DAL market was larger than that in the IAH-DFW market even though total frequency in the IAH-DFW exceeded that in the IAH-DAL market. (Given that the total onboard passengers carried by Delta did not exceed 40,000, one can safely assume that OD traffic would be less than 40,000, and hence, the total OD-traffic in the HOU-DFW would not exceed that in the IAH-DAL market in the years prior to 1987.) Nevertheless, things took a different turn when Southwest reduced services between IAH and DAL in the first quarter of 1988, and that Muse Air left the market, since from then, service between HOU-DFW became increasingly popular such that by the first quarter of 1989, the total OD traffic between HOU and DFW finally surpassed that between IAH and DAL. However, one may conclude with some confidence that frequency and accessibility are the major determinants of the distribution of OD-traffic between the airport-pairs in the Houston-Dallas market. Specifically, after the fourth quarter of 1988, the magnitude of the OD-traffic was proportional to the frequency offered between the respective airport-pairs.

Figure 6.421 Houston-Dallas: Smoothed Quarterly OD Traffic

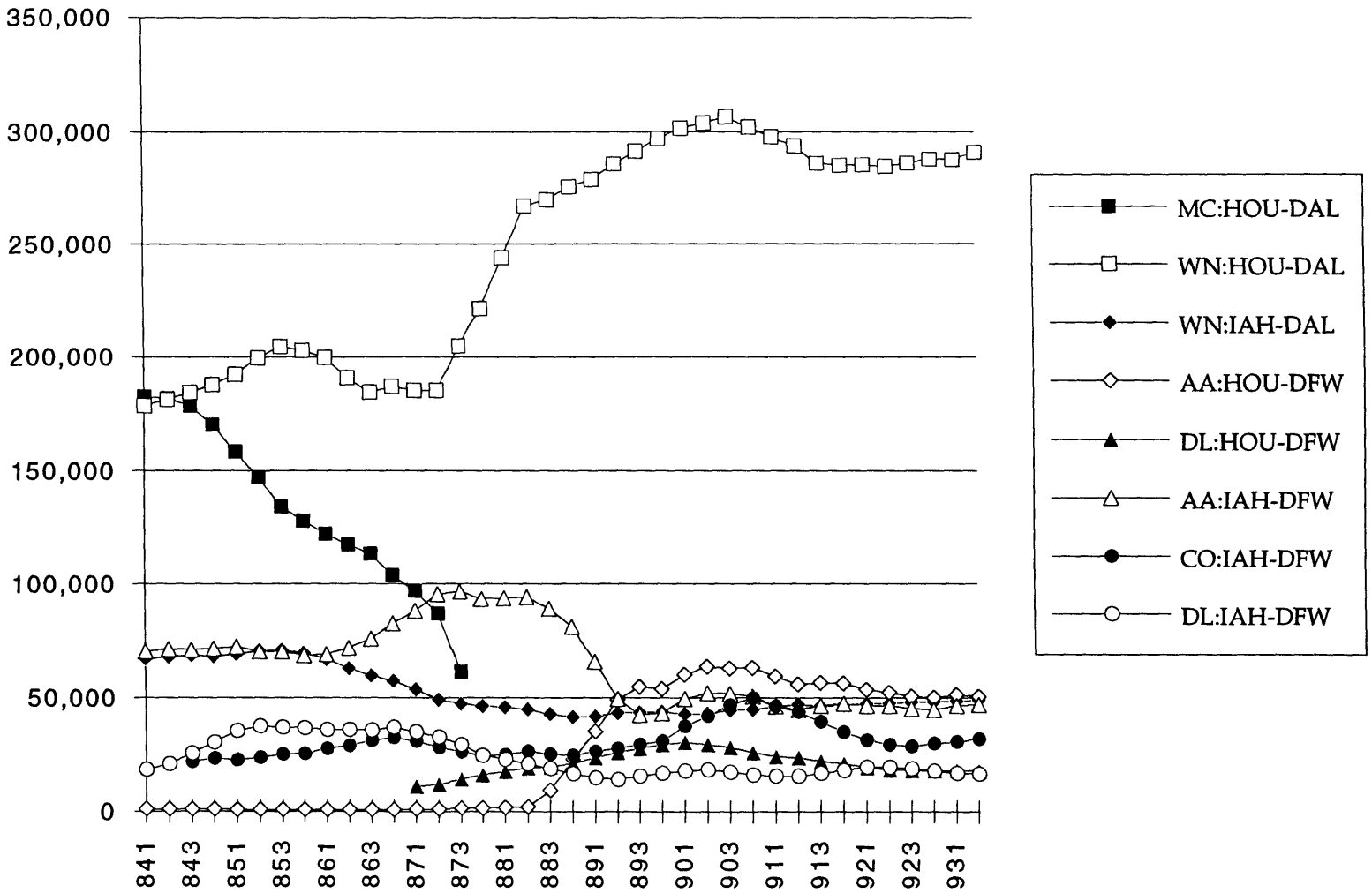


Figure 6.422 Houston-Dallas: Average One-Way Fare ($)

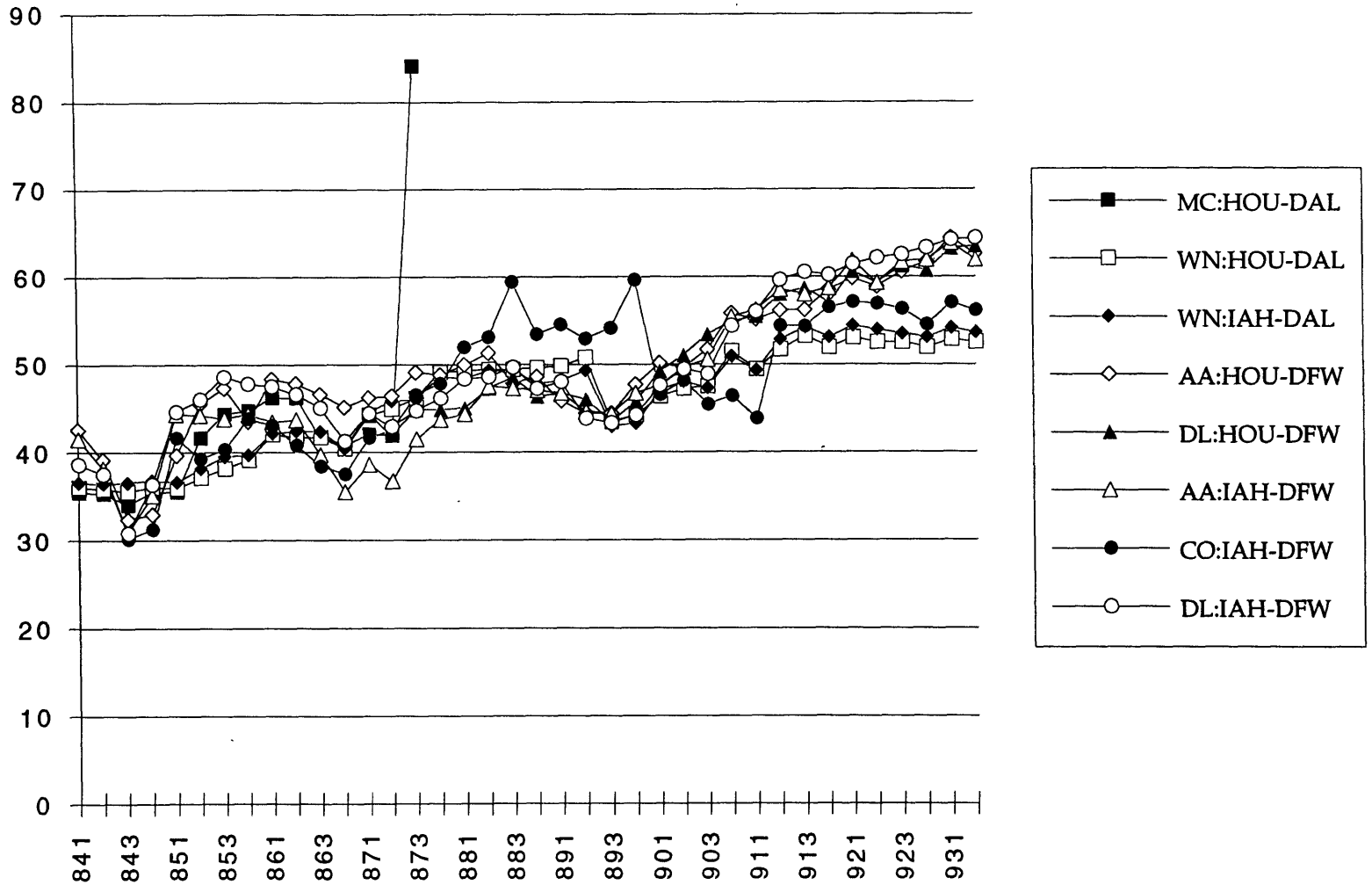


Figure 6.423 Houston-Dallas: Average Number Of Departures Per Day Each Way

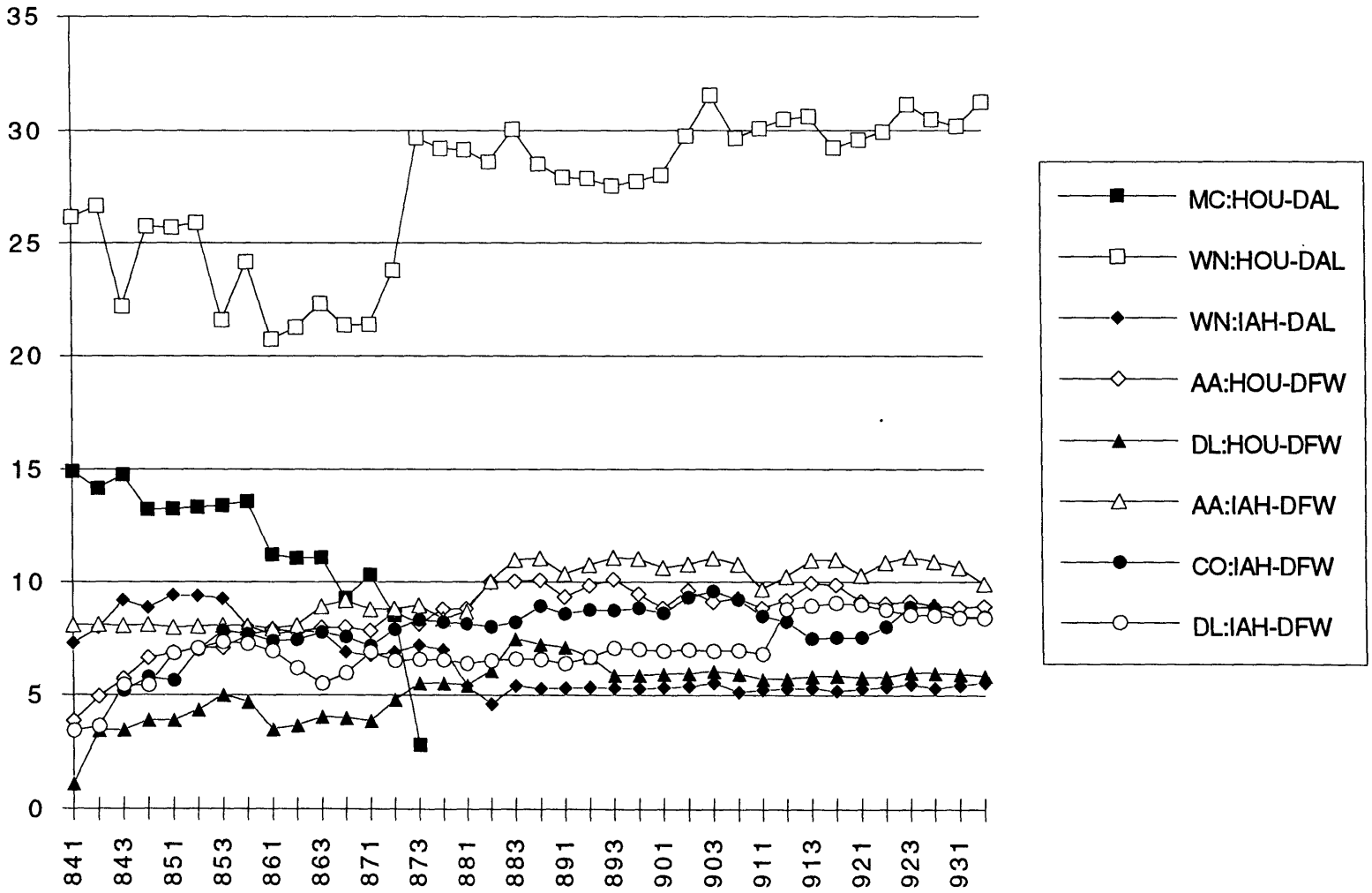


Figure 6.424 Houston-Dallas: Smoothed Quarterly Non-OD Traffic

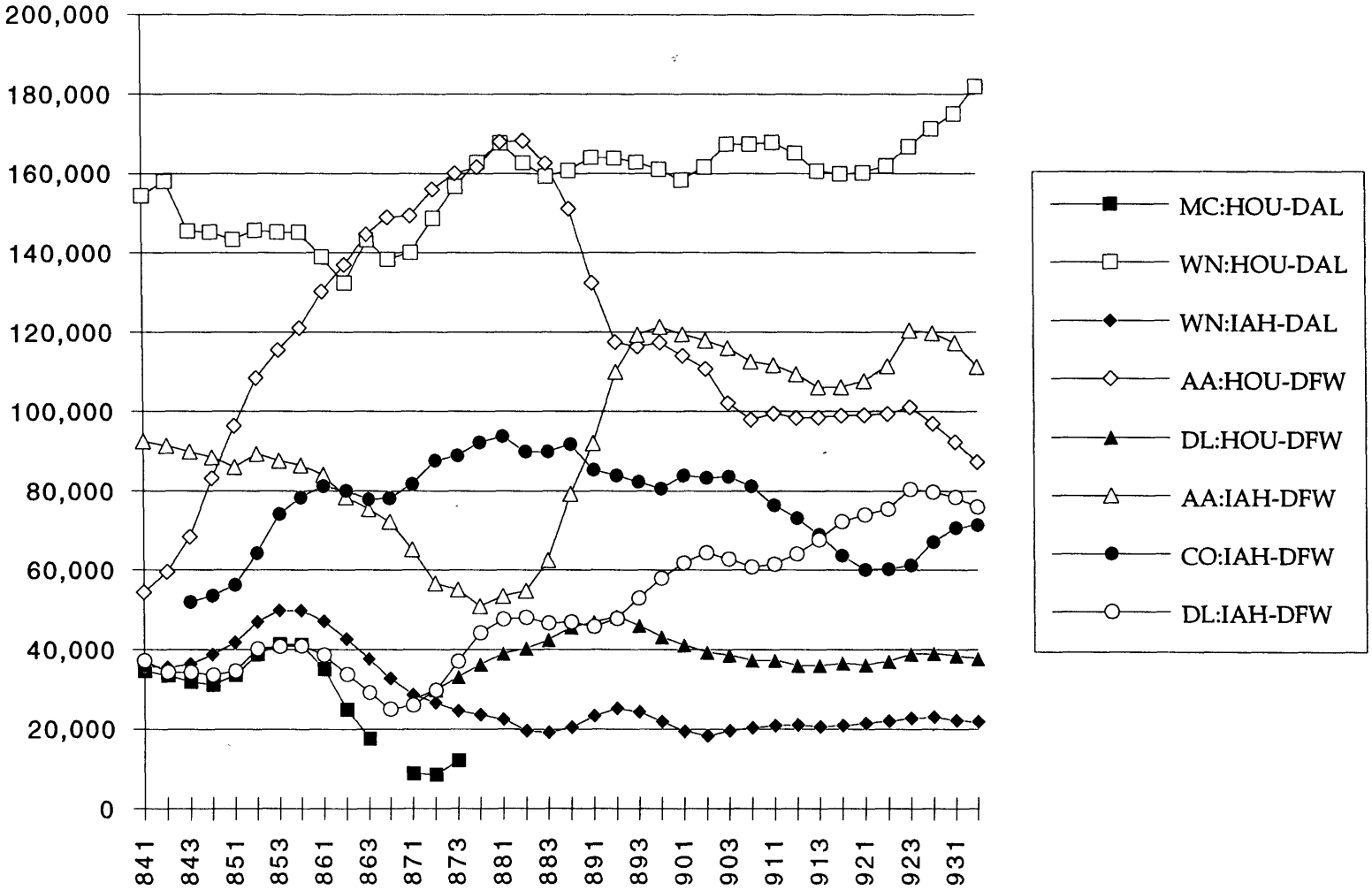


Figure 6.425 Houston-Dallas: Average Quarterly Load Factor (%)

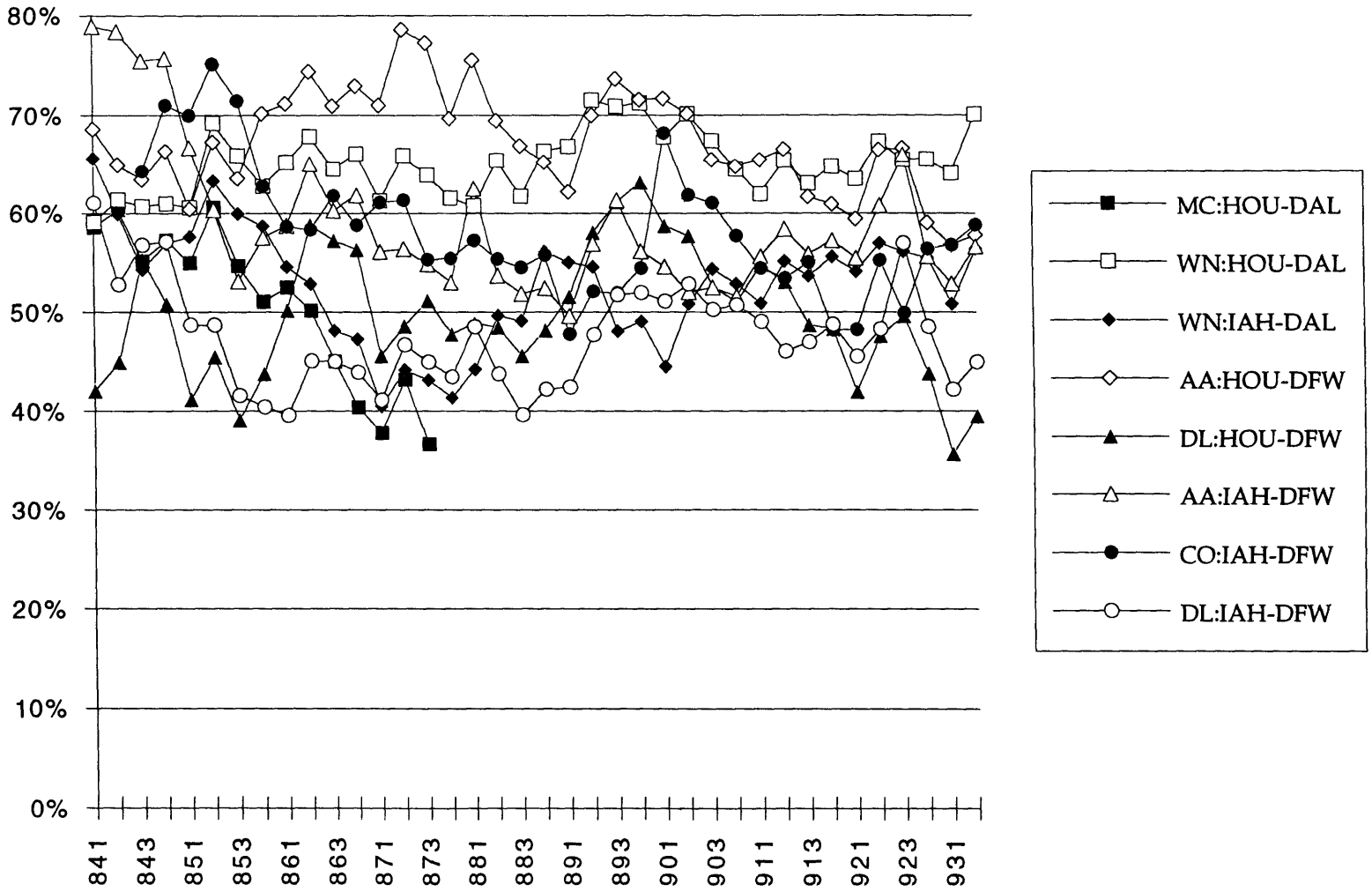
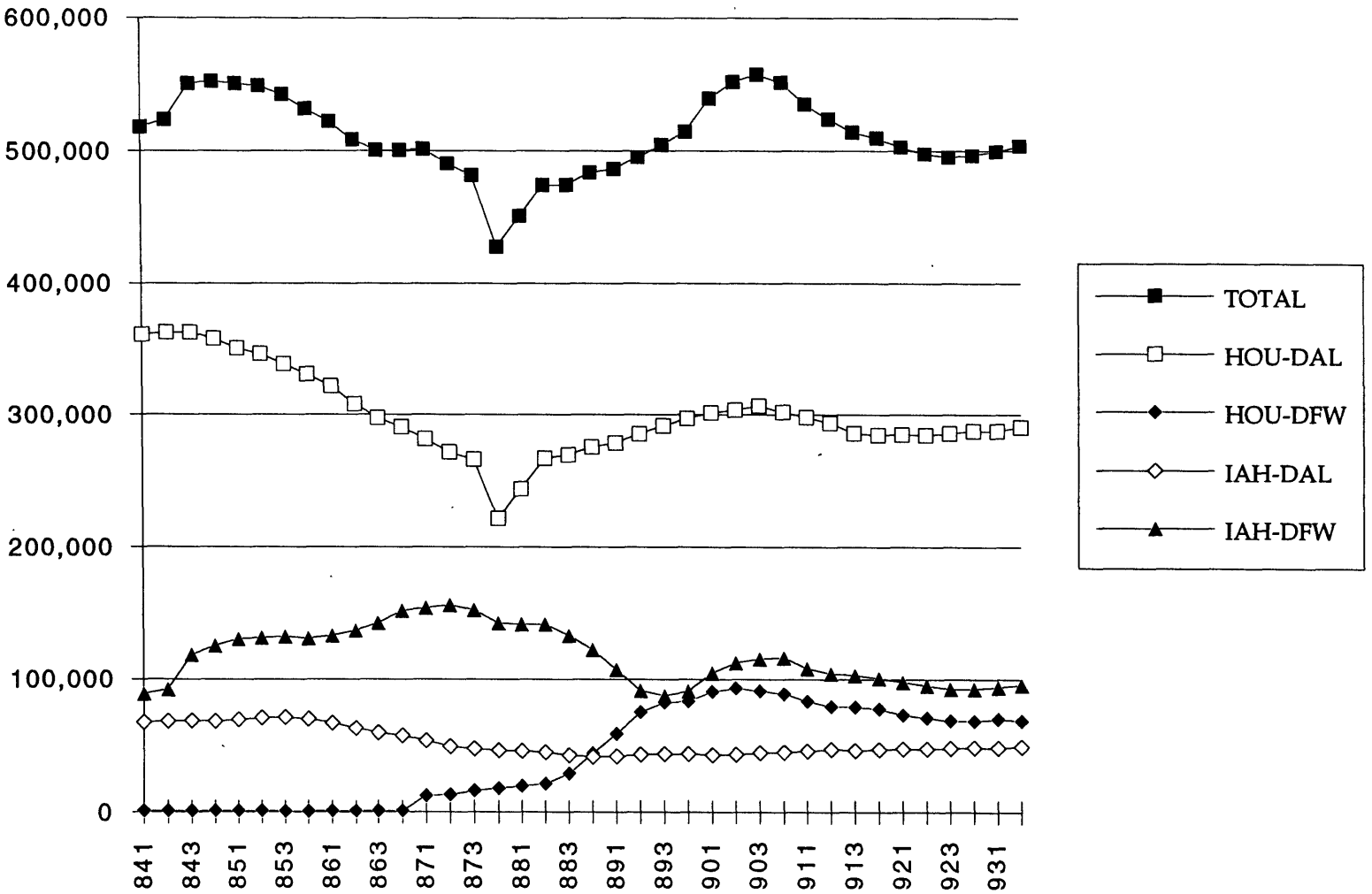


Figure 6.426 Houston-Dallas: Smoothed Quarterly Total Airport-To-Airport OD Traffic



CHAPTER 7

CONCLUSION

7.1 Summary Of Findings

The author had embarked on this research project with the intention of exploring the dynamics of airline competition in a multiple airport environment in the hope that the results would provide some guidance for those involved in the planning of multiple airport systems in a deregulated airline environment. Although it may be premature to put concrete recommendations at this point, one may still consider the following observations that were made based on the anecdotal analysis of the 14 selected city-pairs:

- The competitive behavior of airlines in a multiple airport system does not exhibit a distinctly discernible trend; the complete pattern of service offered by a particular competitor in the multiple airport system and this competitor's strategy strongly determine the overall competitive situation that an airline is in. Additionally, the competitive situation varies over time as the competitive environment changes. Evidently, a challenge initiated by another airline, for whatever reason arising within the airline's current efforts to market its services, elicits a variety of responses and it is the disparity in the level of air service, particularly in terms of frequency, that influences the distribution of passenger traffic amongst the multiple airports.

- Origin-destination (OD) passengers in a given market seem to be attracted by the frequency of service offered by an airline at a particular airport in the multiple airport system, particularly when there is a tendency for airlines to match fares. Thus, for the same fare, accessibility may not be as critical a factor for the OD passenger for the likely reason that a high frequency of service to and from an airport in the multiple airport region would mask the costs associated with accessibility.

- The importance of non-OD traffic for a given market surfaced in all four competitive scenarios. One could confidently infer that the size of the non-OD traffic seems to justify the maintenance of the air service, particularly when the size of the OD traffic is comparatively smaller. More specifically, the existence of a hub at one of the airports in the system perpetuates competition between the airlines even if the local OD market is well served by a new challenger at one of the other airports in the

multiple airport system. Indeed, the airline that establishes a hub would generally offer a high frequency of service between the hub and the spokes, an operational feature that provides both the convenient connections for non-OD passengers as well as a wide choice of departures for the local OD passengers.

- Airlines were observed to provide parallel services to and from airports in the multiple airport system in competition with themselves for extended periods, but such airlines eventually rationalize their parallel services in favor of the dominant airport because of competitive pressures brought about by other airlines serving the dominant airport.

- The four competitive scenarios examined involve secondary airports that offer more convenient access to a large proportion of OD passengers, and these secondary airports have maintained air service over the past 15 years despite changes in the pattern of service, the entry and exit of airlines, and the level of intensity of the competition. However, while such secondary airports continue to offer opportunities for new services that challenge existing services at the dominant airport, it is not clear whether service to a less accessible secondary airport will be viable.

- The shortage of runway capacity, slots, and gates at the major congested airport of the multiple airport system may cause a diversion of service to secondary airports within the multiple airport system. The secondary airport, though functioning as a 'reliever airport', could mean new business opportunities for the airline, thereby giving the airline a chance to capture a larger share of the total OD traffic into and out of the metropolitan region as a whole. In duplicating the service at the secondary airport, the airline would then have to compete with itself.

- The introduction of a new service at the secondary airport often stimulates new OD air travel even after the disappearance of low introductory fares. A possible reason is that if the new service cannot match the frequency at the dominant airport, then the other competitive variable that can make the difference in the minds of air travelers is fares. Once air travelers respond to the new service and a sizable pool of passengers has been captured, the airline may then offer higher fares and frequency to better compete with airlines at the dominant airport.

The above findings provide support for the complex, interdependent relationship between airlines, airports and air travelers that was proposed in Chapter 1. Nevertheless, to arrive at an effective plan for any multiple airport system, one must grasp the dynamics of the competition between airlines, then integrate the ideas with what is known about passenger choice and airport accessibility. Given that airlines respond competitively in a myriad of ways, airport planners should be fully cognizant of the fact that an airline may not promise long-term commitments on airport facilities. In fact, a startling observation is that airlines seem to have little interest in helping an airport grow; they are more pre-occupied with ousting competitors so that they can selfishly dominate an airport, failing which the airlines would just abandon the airport. However, it would be reasonable to say that modeling the competitive behavior of airlines would be a difficult task to accomplish because of the ever-changing ensemble of interdependent factors.

7.2 Some Implications Of The Research

The preliminary investigation of the competitive behavior of airlines in selected dual multiple airport systems has revealed some unexpected results that should be expounded upon as an attempt to incite further research efforts. The first implication deals with the stimulative effects of the entry of low-fare airlines and their impact on competition and fares in the market. The second implication is a general discussion about the usefulness of the observations in helping airport planners better understand how airlines use airports.

7.21 The Effect Of Low-Fare Entrants At Multiple Airport Systems

The importance of traffic stimulation at multiple airport systems, as brought about by the presence of low-fare carriers such as Southwest Airlines and Midway Airlines should not be overlooked. This observation is not entirely new in that de Neufville had once recognized that secondary airports within multiple airport systems may be viable if they are niche-players in the competitive game [11]. Thus, one should not be surprised to learn that Midway and Hobby Airports, though overshadowed by the main airports of O'Hare and Intercontinental respectively, do capture a certain share of the overall market so long as some niche-carriers are willing to invest in resources to set-up operations at such secondary airports. Yet, the whole idea of traffic stimulation in multiple airport systems seems to violate the usual notion that the total market size for a given urban area is fixed, and that in accordance with the economic concept of the zero-sum-game [55], each additional division of the pie would only create a smaller

piece of the pie for each additional participant in the game. Nevertheless, evidence of traffic stimulation at multiple airport systems may give airport planners and airline managers a reason to exploit untapped opportunities; the airport planners may consider building additional airports within a large metropolitan area in order to relieve congestion at the established airports or even encourage the use of under-utilized airports in the vicinity, while airline managers may seize the opportunity to develop a differentiated air service at such secondary airports.

To this end, Southwest Airlines may be cited as a fervent pursuer of less congested airports in large urban areas that have sizable origin-destination traffic, this being one of the elements of its strategy for success. In particular, Southwest firmly believes that secondary airports are conducive for its high-frequency, quick-turnaround operations, whereby busy slot-controlled airports would only thwart its efforts to expand to satisfy the typically well-stimulated demand [56]. For example, in the California-corridor service, where Southwest has been very successful with its services to the airports of San Jose, Oakland, Burbank, and Orange County, passenger growth rates in the Los Angeles-San Francisco market have exceeded 200%, with Southwest dominating the corridor market [57]. Yet, Southwest cautions that it does not pursue growth for the sake of growth, as can be seen by its avoidance of major hubs in favor of close-in airports such as Hobby, Detroit City, Midway, and Love Field. Instead, Herbert Kelleher, Chief Executive Officer of Southwest, believes that mass does not always mean profitability, but Southwest's "critical mass is our presence on each route." [56] Upholding its strategy year after year, Southwest has aggressively further developed its network to cover the Pacific Northwest (with the acquisition of Salt Lake City-based low-fare carrier, Morris Air Corp.) and the Midwest, and most recently, the network has spread as far east as Baltimore, Maryland. Regardless, given its consistent stream of profits over the years, Southwest sees every reason to abide by its principle that markets can be grown by pricing air service low enough to entice people out of their automobiles, and only using less congested airports.

Southwest's strategy did attract the attention of Irving Tague, a former Hughes Airwest executive who founded Midway Airlines in 1976 [58]. Tague aspired to accomplish at Midway Airport what Southwest had done at Love Field. However, quite unlike Southwest, Midway Airlines was not as consistent with its product orientation. Specifically, Midway launched no-frills service in 1979, but by 1983, in order to avoid a costly fare war with the majors, it had decided to skim-off a segment of the passengers by being a business class airline, offering four-abreast seating and special amenities [59]. Then, by 1987, Midway had changed its mission to provide "a good service for a

reasonable price" [58] in that except for first class and hot meals, Midway offered all the amenities associated with a full-service airline such as assigned seating and interlining. Midway's success in the mid-80s did, however, attract competitors to its hub at Midway Airport: Southwest, Continental, Northwest, America West, United Airlines, and Midstates. Nevertheless, Midway welcomed competition because competition added traffic and prestige to the airport. In any case, it reasoned that it could well defend its turf since it had secured long-term leases on about 70% of Midway Airport's limited facilities. Also, having captured 80% of the traffic at Midway by 1987, Midway was confident that there would not be sufficient room for another airline to operate a hub like its own at Midway Airport. However, by flirting with various strategies and other reasons, Midway folded at the end of 1991, while Southwest continues to parade its seemingly endless stream of profits even until today. Although Midway managed to secure a fraction of the total traffic at Chicago, it was not as aggressive as Southwest in that it never dominated any Chicago market.

One might well wonder, now that stimulation of OD traffic has been observed in many of the markets analyzed, if air travelers have reaped benefits from the offer of a different service at a different airport within the multiple airport system. If one can agree that the entry of Southwest and Midway has brought about a general lowering of fares and an additional choice of air service into and out of the urban area, then the consumers have indeed gained from the competitive games played by the airlines at multiple airport systems. The other question is: if the air travelers are paying lower fares, are the airlines then providing commercially viable service? In short, one would hope that the increase in traffic would more than compensate for the lowering of the fares so that an overall increase in revenue is recorded. Yet, to determine the profitability of a flight leg is perhaps elusive for an airline that has a network. Without detailed information and statistics, the author may not adequately address whether the airlines have reaped benefits from their operations at multiple airports. However, since the anecdotal analysis reveals that airlines continue to offer services even though the pool of OD traffic is smaller than that of the non-OD traffic, one may conclude that the non-OD traffic plays a significant role in determining the viability of the service, however the term "viability" may be defined. The fact that recent statistics reveal that low-fare carriers' share of US Available Seat Miles in markets under 1,200 miles is now 12.7% or double that of 5.7% in 1992 [60] may indicate that the power of low-fare entrants should not be underestimated. In addition, other analysts who have closely studied the trends in air fares for a representative number of O'Hare city-pair markets have claimed that the low fares at Midway have "spilled over" to prices at O'Hare [61], and that this

encouraging trend implies that airlines are now aware that business passengers and their companies are taking advantage of lower fares as well. In response to the shift, affected US majors have responded by reducing some fares and keeping others unchanged in order to remain competitive.

7.22 Addressing Risks In Airport Planning

Inevitably, the activities of low-fare carriers, which are usually associated with sudden increases in traffic at an airport, do raise concern amongst airport planners. John J. Smith [62], a former economist with the Federal Aviation Administration (FAA), dwells on the idea that the maturity of the US domestic travel market and the fierce competition in specific parts of the market jointly create uncertainty in airport planning. Indeed, given the official FAA forecast of US domestic passenger traffic in Revenue Passenger Miles of an annual rate of only 3.7% through 2005 [62], which is lackluster compared to the double-digit growth in earlier years, airport planners may have to contend with slower growth and hence a possible adverse impact on airport finances. However, Smith believes the real uncertainty lies in the ability of these short-haul, low-fare services to generate substantial increases in enplanements at certain airports. The apparent contrary expectations of a mature air travel industry could confound airport planners as to how much to invest in the expansion of facilities to embrace the sudden growth, and whether the investment will pay-off in the long-run, especially if the success of the airport is tied in some way to the success of the airline's operations at that airport. Given that Southwest has been highly successful in the airports that it had served, one would hope that the possible success of major carriers which are now adopting a variant of the model (namely, United, USAir and Continental) should bring good news to airports who may be keen to host such airlines. A subtle point to recognize is that Southwest's strategy seems to work well in uncongested fair-weather airports; the direct transferability of the model to congested airports could be questionable. While Southwest has clearly avoided the slot-controlled airports of LaGuardia, John F. Kennedy, Washington-National, and O'Hare, it has ventured to the secondary airports of Baltimore-Washington and Midway. In particular, Baltimore-Washington International, which had little low-fare service before the fall of 1993, had experienced a significant growth in traffic of 48% from May 1993 to May 1994 [62]. Part of the growth is attributed to Southwest, USAir and Continental's offer of low fares, which has stimulated local traffic, while the other contributor is the diversion of traffic from nearby Washington.

Although Moody's Investors Services [62] published an analysis in April 1994 stating that airport and airline credit quality ratings may not be linked, others believe that an airline's economic and financial status is of concern to airport planners in that an airline's potential for success or failure does become part of the overall risk assessment and financial planning processes that airports conduct. Even under the current deregulated regime, one could say that certain airports have a better chance of winning than others. Smith mentions that winners are airports that host strong carriers that fly substantial origin-destination traffic, or those that have grown as a result of stable low-fare services. On the other hand, potential losers could be airports which host high levels of connecting traffic and financially weak carriers. In an environment where airports compete to be connecting complexes for airlines, airports that do not have high origin-destination traffic would run the risk of being empty once a hub-carrier decides to move away. Thus, by understanding the competitive dynamics of airlines operating in multiple airport environments, airport planners should then be able to anticipate the risks inherent in the airport planning process.

Yet, to attract airlines to serve an under-used secondary airport that has already been built is perhaps a tricky affair which may require ingenious airport marketing efforts. While actively persuading an airline to start operations at an under-used secondary airport seems rational, creating an overall awareness amongst the traveling public and travel agents that convenient air service is available at the secondary airport could be equally essential. The fact that Southwest has done wonders for the many secondary airports in huge urban areas is an indicator that there is hope for multiple airport systems to be viable. As always, perhaps the right dose of support from the local politicians should also be instrumental in making multiple airport systems successful, particularly if the politicians see developing the airport as a means of boosting the local economy and employment opportunities [63].

7.3 Further Research

The current thesis has merely focused on the competitive behavior of airlines in dual airport systems so as to initiate the research effort with something simple. However, the study could be extended to that of, say, tri-airport systems. Although the thesis has, so far, captured, qualitatively, the competitive dynamics of the airlines, the author speculates that a quantitative model of the competitive behavior , if at all conceivable, would be of value to airport planners. For now, grappling with the complexity of the dynamics of airline competition in a deregulated environment would be the first and toughest hurdle to overcome.

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