CRANFIELD UNIVERSITY

COLLEGE OF AERONAUTICS
DEPARTMENT OF AIR TRANSPORT

Ph.D. Thesis

Abhimanyu Bissessur

THE IDENTIFICATION AND ANALYSIS OF THE CRITICAL SUCCESS FACTORS OF STRATEGIC AIRLINE ALLIANCES

Supervisors:
Dr. Fariba Alamdari
Prof. Rigas Doganis

October 1996

To Jebnath and Saraswatee Bissessur

ABSTRACT

Since the beginning of the decade, the structure of the industry has been changing rapidly as airlines from various parts of the world have been forming alliances. These alliances transcend the traditional types of co-operation which have always existed in the industry and constitute a strategy designed to give the partners a competitive edge.

However, many of these alliances are failing. This can be attributed to a poor understanding of the managerial and operational characteristics of airline alliances. This research attempts to correct this deficiency by identifying and analysing the factors which are important to airline alliance success.

In order to set the background of the research, the various ways in which firms have traditionally been linked are reviewed. The evolution of co-operation in the airline industry in the US, Europe and Asia is traced and the forces which have driven airlines to adopt the alliance strategy are identified. The various collaborative strategies of airlines are described.

The definition of alliance success is critical to this research. Various definitions are explored and the ones considered most appropriate for this study are taken as alliance stability and alliance operational performance. The issues to be considered in ensuring airline alliance stability are qualitatively analysed. Among the most important ones are a pragmatic and careful approach in the formation process of the alliance, an understanding of the relationship between the partners with particular importance given to commitment and the generation of trust, and recognition of the evolutionary process of alliances as the priorities of the partners change over time.

The operational objectives of airline alliances are identified and classified as either market-related or production-related. Market-related objectives include economies of scope and density, and market power. Alliance performance is mathematically modelled using linear and logit regression techniques. The results of the analyses point to the following: network size and network complementarity, network integration, connection quality, the type of flight (on-line, code-shared or interline) and alliance frequency of service as important alliance success factors. The reaction of competitors is also found to determine the benefits of airline collaboration.

On the production side, the objective of allying is to decrease unit costs and increase efficiency by combining certain operational areas. A case study of Austrian Airlines is performed to identify the cost and productivity areas which have benefited from alliance formation. Graphical analysis shows that benefits were reaped mostly in the areas of labour productivity and aircraft utilisation. This implies that these are the areas which should be targeted when making use of the alliance strategy. Unit costs were not found to be greatly affected by alliance formation.

ACKNOWLEDGEMENTS

I wish to thank my supervisors Dr. Fariba Alamdari and Prof. Rigas Doganis who have guided and encouraged me throughout these three years and who have always come up with very constructive ideas whenever I was experiencing difficulty. I am also grateful to Mr. Ian Stockman, and to the secretaries of the Department, Frances Creckendon, Rosa Bardwell and Marilyn Bryson who have been of great help at all times. My gratitude extends to the whole staff of the Department of Air Transport whose clear and articulate presentations have always been an inspiration. Finally, I want to thank the Overseas Research Students Awards Scheme and the Cranfield University, College of Aeronautics for having provided the financial support for the completion of this degree.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

Table **Page**

NOTATION

ASK	Available seat-kilometre
CAB	Civil Aeronautics Board
CPI	Consumer Price Index
CRS	Computer Reservations System
DoT	Department of Transportation
EC	European Commission
EU	European Commission
FFP	Frequent Flyer Programme
GDP	Gross Domestic Product
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
O-D	Origin-Destination
RPK	Revenue passenger-kilometre

Airline codes

AA	American Airlines
AF	Air France
AI	Air India
AN	Ansett Australia
AY	Finnair
AZ	Alitalia
BA	British Airways
BM	British Midland
CI	China Airlines
CO	Continental Airlines
CX	Cathay Pacific
DL	Delta Airlines
GA	Garuda Indonesia
IB	IBERIA
JL	Japan Airlines (JAL)
KE	Korean Air
KL	KLM Royal Dutch Airlines
LG	Luxair

MH	Malaysia Airlines
NH	All Nippon Airways (ANA)
NW	Northwest Airlines
NZ	Air New Zealand
OA	Olympic Airways
OS	Austrian Airlines
QF	Qantas Airways
SK	Scandinavian Airlines System (SAS)
SN	SABENA
SQ	Singapore International Airways (SIA)
SR	SWISSAIR
TG	Thai Airways International
TW	Trans World Airlines (TWA)
UA	United Airlines
US	USAir
VN	Vietnam Airlines

PART I

BACKGROUND

This part provides the background information on which this thesis is constructed. The need for the research is first considered and its aims are outlined. The various types of interfirm agreements are then described and the ways in which they have been classified are reviewed. Finally, the history of co-operation in the airline industry is analysed.

1. INTRODUCTION

Introduction

The aim of this chapter is to provide an introduction to the thesis. The emergence of co-operation in the airline industry is briefly described with a contrast made with the newly-formed strategic alliances. An explanation for the formation of strategic alliance formation is provided. The need for the research is given and its aims are outlined. The chapter ends with the layout of the thesis.

1.1 Airline Co-operation

Co-operation between airlines in the world has existed ever since the inception of the airline industry. Houtte (1993) even argues that co-operation is one of the main characteristic that distinguishes the airline industry from other sectors of the economy. Agreements have in most cases been translated into technical co-operation: the exchange, leasing and pooling of aircraft and aircraft parts and the maintenance of aircraft and engines. One form of co-operation which was deemed necessary owing to the tight regulatory framework in which airlines were (and still are) forced to operate is interlining. Being largely confined to their home states, airlines had very limited networks and therefore had (and were encouraged by regulatory agencies) to enter into interline agreements so that the passenger could be taken to his/her final destination.

What differentiates previous types of agreements with contemporary airline alliances is mainly that they have become increasingly *strategic*. In other words, the degree of commitment in, and the importance carried by, alliances in the corporate portfolio of airlines has increased dramatically since the beginning of this decade. Airlines now consider alliances as an effective means of acquiring a competitive edge over their competitors and expect their alliances to yield substantial payoffs in terms of increased traffic flows and eventually have a positive effect on their bottom line.

Alliances can also be essential for survival as the British Airways-USAir partnership demonstrates. From the point of view of USAir, the $400 mn. investment into it by British Airways occurred at a time when the carrier was considering Chapter 11 bankruptcy status to remain in operation.

Compared to past agreements, the area of focus of current alliances has changed. Indeed, while co-operation was previously geared to technical aspects, alliances are becoming increasingly market-motivated. Marketing practices such as code-sharing (the use of an airline's two-letter code on another airline's flight), block-spacing (the purchase and marketing of a number of seats on another airline's flight), franchising, joint scheduling, and combined Frequent Flyer Programmes (FFPs), are now widespread in the airline industry. Owing to its ability to expand networks at relatively low costs, code-sharing is now increasingly superseding interlining and it is a feature of most airline alliances. Burton and Hanlon (1995) point out that while past co-operation occurred between airlines operating on the same routes for pooling to be possible, airlines are now seeking partners based in other world regions to achieve market access. Examples of widely-publicised airline alliances designed to achieve marketing objectives are the British Airways-USAir, KLM-Northwest Airlines and Lufthansa-United Airlines partnerships, the European Quality Alliance (Swissair Austrian Airlines and Sabena[1]), the Global Excellence (Swissair, Delta Airlines and Singapore International Airlines), the failed Alcazar alliance which was meant to add KLM to the European Quality Alliance, and the newly-announced British Airways-American Airlines tie-up.

The phenomenon of alliance formation struck the airline industry at the beginning of this decade. In the 1980s, another phenomenon which nevertheless confined itself to the US airline industry was that of airline mergers. These two trends are comparable in that they were both motivated by the desire of airlines to grow and expand their networks. The growth imperative comes from increases in the intensity of the

[1] Sabena replaced SAS in mid-1995.

competitive environment as brought about by industry deregulation[2] and the globalisation of markets. However, the situation in the US differs greatly from that in the rest of the world. While mergers are acceptable in the US[3] (and now in Europe following the adoption of the Third Package), there are a number of legal and nationalistic barriers to mergers/take-overs of airlines based in different countries. Those barriers are extremely difficult to overcome and constitute one of the main reasons why airlines have chosen the alliance strategy as a way of expansion instead of mergers. In addition, airlines have discovered that alliances are a less costly means of enjoying the benefits of mergers and take-overs, and have the advantage that the problems of the partner need not to be shouldered as is the case with mergers and take-overs.

1.2 The Need For The Research

Since the beginning of this decade, there has been a growing realisation of the advantages that airline alliances can provide. This has given rise to a state akin to panic as many airlines have scrambled to find a partner before all the attractive ones were taken up (Bullard, 1994). Consequently, the number of alliances has risen rapidly to reach about 400 in June 1996[4]. However, the number of *successful* airline alliances is way below that figure. The air transport literature is replete with alliances which are performing below expectation. An indication of the dissatisfaction of airlines with their alliances is the high rate at which partners are dropped. The success rate of airline alliances has been studied by the Boston Consulting Group (BCG) using alliance survival as the success criterion[5]. In general, the study indicates that the success rate of alliances is very low. Intercontinental alliances have higher failure rates than those which are either domestic or regional in geographical scope. Non-equity alliances were also found to be highly prone to failure. The lack of success of

[2]Deregulation of the domestic airline industry was brought about in the US in 1978 by the Airline Deregulation Act. Gradual deregulation, termed liberalisation, has been implemented in Europe since 1990 by the First, Second and Third Packages. The last phase of deregulation will take place in 1997 when cabotage will be allowed.
[3]Provided antitrust regulations are not violated.
[4] See *Airline Business*, June 1996.
[5] It should however be noted that alliance survival is not necessarily a good indicator of alliance success, especially when there are high exit barriers such as expensive 'divorce' costs.

strategic alliances was also observed by Doganis (1993). In an analysis the effects of European liberalisation, he points out that the marketing alliances between European carriers have not yielded the expected benefits, and that most of them have been short-lived. Notorious examples of alliances which have failed or which are currently experiencing problems for various reasons are the former European Quality Alliance, Alcazar, the Latin-American alliances of Iberia, British Airways-USAir and KLM-Northwest Airlines.

Why are airline alliances unable to yield the expected benefits and even survive? The fact that airline alliance formation is a relatively new phenomenon is one of the main reasons for their failure. Indeed, the understanding of the managerial and operational characteristics of airline alliances is piecemeal and is reflected in the paucity of academic research about alliances in the airline industry. Research in that field does not seem to have kept in pace with the rapid progression of the airline alliance phenomenon. Furthermore, any study produced has focused primarily on airlines' motivations for entering into alliances, and on the effects of those alliances on the market and on consumer welfare (see Youssef, 1992; Youssef and Hansen, 1994) rather than on how to make the alliances stable and produce the expected benefits.

1.3 The Aims Of The Research

With the increasing number of alliances, it is felt that the airline alliance phenomenon is getting out of control and many, if not most, airlines are starting to co-operate without properly understanding what they are getting into. The aim of this research is to fill this gap by contributing to a better understanding of the structural and operational issues in airline alliances. Stated formally, its objective will be:

> **The analysis of the critical factors which contribute to airline alliance success**

Focus will be primarily on the internal stability of airline alliances and on their goals, namely the access to new markets, the increase in market share and cost rationalisation. The basic methodology will be to select a number of successful and failed airline alliances and analyse them to extract those factors which have contributed in bringing about the intended goals. The study can effectively be used as a management tool that will help managers when they design their alliances to increase the probability of success. It is recognised that no exact answers can be provided as each airline alliance is unique and can be driven by different motives. However, the research can provide managers with guidelines which they will find useful in their decision-making process when selecting their potential partners and operationally structuring the alliance. The study is all the more important as the relaxation of legal constraints to mergers and take-overs is not anticipated in the near future. Consequently, the importance of the alliance strategy as a means of growth and of achieving greater competitiveness will be maintained and most probably increase with time. This mandates a proper understanding of the characteristics of airline alliances.

The study also brings together the widely-dispersed extant knowledge on airline alliances, and investigates the adaptability of alliance theories developed in the social and business disciplines to the airline industry. It is thus hoped that the groundwork set in this study will be used as a springboard in the future when deeper research is made into the subject of airline alliances.

The alliance phenomenon is far from subsiding. Indeed, nearly every single day, there are news of broken alliances or of alliance newly formed. The changes are occurring so rapidly that it is sometimes difficult to keep in pace with them. It is therefore important to define a cut-off point in time after which any developments in the state of the airline industry as far as alliances are concerned will not be taken into consideration. That cut-off point is taken as June 1996 as the results of the study are scheduled to be submitted in October 1996.

1.4 Thesis Structure

This thesis is divided into four main parts. Part I aims to provide the reader with an introduction to alliances both inside and outside of the airline industry. Chapter two provides a general definition of the strategic alliance. The various types of alliances in existence are detailed and an attempt is made to define the scope of the strategic alliance and how it differs from the other alliance types. The different means of alliance classification which have been devised in other academic research are then reviewed to show how strategic alliances differ from other types of partnerships and how that organisational form can generate controversy. This exercise also enables the location of contemporary airline alliances on the alliance spectrum. Chapter three analyses the evolution of co-operation in the airline industry. Focus is on the experience in the US following airline deregulation with a contrast made with the European and Asian regions.

Part II deals with the new types of alliances which are being formed between airlines. Chapter four examines the change in the structure of the airline industry world-wide as a result of alliance formation. The legal and consumer welfare implications of alliances are examined. Chapter five is devoted to the socio-economic and political pressures underlying the formation of strategic alliances. Two major theories are reviewed, followed by an examination of their applicability in explaining the trend of alliance formation in the airline industry. This leads on to an alternative theory of airline alliance formation focusing on the socio-economic and political occurrences which are characteristic of the airline industry. Chapter six describes the ways in which alliances are used to yield benefits.

Part III is concerned with the modelling of airline alliance success. In Chapter seven, the research approach is developed and the reasons for the selection of that particular approach are detailed. Chapter eight considers the management aspects in alliances. Much is borrowed from the extant literature on alliances to gain an understanding on how airline alliances should be managed. The steps that need to be taken in the formation process of alliances are reviewed. This is followed by an analysis of the structure of the relationships between the firms involved in an alliance. The different types of compatibility that need to be considered in the choice of a suitable alliance partner are discussed.

Chapter nine addresses alliance performance in terms of the achievement of its operational goals. These goals are identified and a means of classifying them is devised so as to enable their measurement.

Chapter ten deals with the marketing goals of strategic airline alliances. The focus is on the goal of accessing new markets and benefiting from traffic feed. How those goals are achieved in practice is analysed. The methodology used to measure the degree of goal achievement and to isolate alliance effects is then described. Selection and measurement of variables to be incorporated into the model are explained. Alliance success is then mathematically modelled using the technique of multiple linear regression.

In Chapter eleven , the focus is on the goal of gaining market share. As in Chapter ten, the method by which alliances enable this in practice is described and the means by which success is measured is detailed. Success is then mathematically modelled using both linear multiple regression and the logit techniques.

Chapter twelve deals with cost reduction via airline alliances. The fields where collaboration can lead to lower unit costs are identified and a graphical analysis of unit costs of Austrian Airlines is performed to reveal any changes caused by the formation of the European Quality Alliance.

Finally, Part IV which consists of Chapter thirteen, presents the conclusions that can be drawn from the research, any recommendations that can be made, and outlines proposals for further research.

The plan of the thesis is summarised in Figure 1.1. This figure is presented at the start of each part so that one can see where one has reached in the thesis.

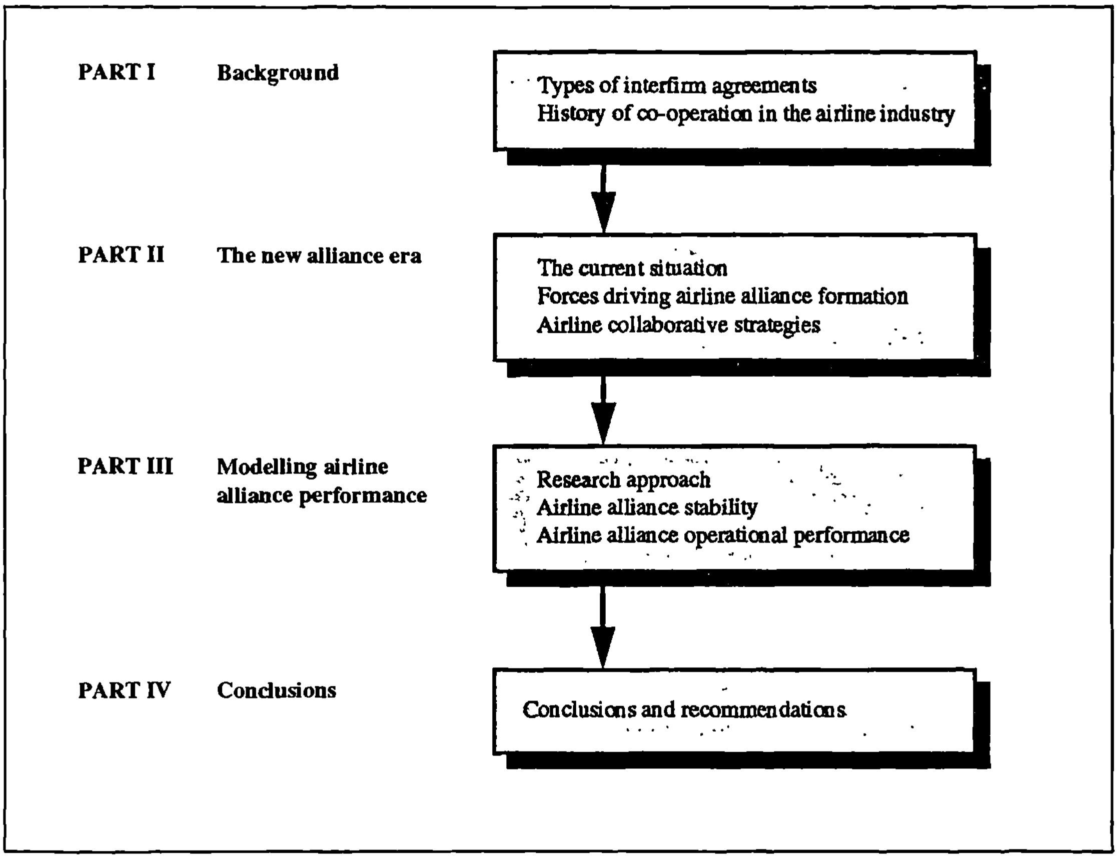


Figure 1.1 Thesis structure

1.5 Conclusion

Co-operation between airlines in all parts of the world is becoming increasingly strategic. The number of cross-border airline alliances is increasing rapidly. However, the success rate of the alliances is very low implying that airlines lack the necessary expertise to design and operate their alliances appropriately. This research will try to help them by identifying the factors which can lead to alliance success. In addition, this thesis will produce an integrated framework bringing together the knowledge about airline alliances and analyse the adaptability of outside alliance theories to the airline industry.

2. TYPES OF INTERFIRM AGREEMENTS

Introduction

The strategic alliance is a relatively new type of organisational form which is rapidly replacing the Porterian firm (Porter, 1985) isolated in its business environment. Owing to their recent emergence, there is some confusion as to what alliances really are. Confusion particularly prevails as to how alliances differ from mergers and acquisitions. The purpose of this chapter is to identify the different types of alliances in existence and analyse how they differ from one another. The various parameters by which alliances can be classified are defined. Thus, it will be clear to the reader as to what an alliance really is.

2.1 The Need For A Definition

The term 'strategic alliance' is often loosely used to describe any type of partnership existing between two or more firms. For example, Cravens and Shipp (1993) note that vertical supplier-producer relationships are also classified as strategic alliances in many cases. Also, there exists a certain degree of confusion between the terms 'strategic alliance' and 'joint venture'. This is apparent in the works of Lei and Slocum (1988) who also consider licensing arrangements and consortia, keiretsu and chaebols as strategic alliances, of Harrigan (1987) and of Lorange and Roos (1992) who use the terms 'strategic alliance' and 'joint venture' interchangeably. Since this research is concerned wholly with strategic alliances in the airline industry, it is essential to have a clear understanding of the scope of a strategic alliance and this is best done by contrasting it with other types of existing partnerships.

2.2 Types Of Alliances

Strategic alliances form part of a broader class of organisational forms which have been termed as either hybrid organisational arrangements (Powell, 1987; Borys and Jemison, 1989), interorganisational relationships (Oliver, 1990; Van de Ven and Ring, 1994), networks (Thorelli, 1986), collaborative business arrangements (Burton, 1994). coalitions (Porter and Fuller, 1985), quasifirms and transorganisational systems (Achrol and Scheer, 1990). Within this group fall mergers and acquisitions, joint ventures, formal and informal co-operative ventures, supplier-manufacturer and manufacturer-distributor collaborations. These different types of alliances are described in the next sections. Examples of alliances in the airline industry are also presented wherever relevant.

2.2.1 Acquisitions and mergers

An acquisition occurs when a firm takes over another one with the consequent loss of the corporate identity of the latter. It offers full control over the purchased firm. Acquisitions are used mainly to obtain another firm's core skills or resources. Mergers are slightly different from acquisitions in that two or more companies accept to combine together their operations to yield a brand-new company. The difference can be said to lie in the approach; an acquisition is the more offensive of the two. The combination of forces is intended to strengthen the competitive advantage of the merging firms. There is a tendency to use the two terms interchangeably in the business literature.

Acquisitions and mergers became widespread in the US airline industry in the years following deregulation. These mergers were driven mainly by the need to grow since size was considered to carry with it economic efficiency via economies of scale[6]. Economies of scope were also responsible for the growth imperative. In Europe, the only notable airline mergers/acquisitions occurred between British Airways and

[6] Economies of scale refer to the decrease in unit costs with an increase in firm size (output). Economies of scope arise when it is less costly to combine two or more product lines in one firm rather than produce separately. Economies of scale and scope in the context of the airline industry are considered in depth in Chapter 9.

British Caledonian and Dan Air, and between Air France and UTA. Mergers and acquisitions in the airline industry are considered in greater detail in Chapter 3.

2.2.2 Joint ventures

A joint venture consists of the formation of a separate independent organisation by the venture partners to carry out certain defined tasks. The new entity operates independently of its parents, though it benefits from inputs from them. Part of its outputs may flow back from the joint venture to the parents. Joint ventures are usually used to exploit a new product market opportunity, provide access to new markets, share costs and financial risks, gain a share of local manufacturing profits, or acquire knowledge and technology for the core business (Cravens and Shipp, 1993). A typical example of a joint venture is the CFM International jet engine alliance formed by General Electric (GE) in the US and SNECMA in France.

Airlines formed as joint ventures are not common in the industry. One example is Air Russia which was a joint venture between British Airways and Aeroflot. The joint venture failed owing to its inability to operate within the uncertain legal and political climate prevailing in the CIS states (Nelms, 1992). Another is EuroBerlin jointly created by Air France and Lufthansa. Some joint ventures have been set up by companies which are not necessarily airlines. For example, Royal Air Cambodge is a $10 million joint venture between the Cambodian Government and Malaysian Helicopter Services. Another example is Air Micronesia which results from collaboration between Continental Airlines and United Micronesia Development Association.

Airlines have a greater tendency to form joint ventures which take responsibility for only part of their operations. Singapore Airlines (SIA), for example, has two joint ventures with Beijing Capital International Airport specialising in catering and cargo and ground-handling services. The ground handling joint venture also involves China Southern. Another example is AirLanka Catering Services which is a joint venture between AirLanka and Thai Airways.

2.2.3 Strategic alliances

Formal and informal co-operative ventures constitute the core of what are known today as strategic alliances. The majority of airline alliances in existence today fall into this category. Formal alliances incorporate a binding agreement, usually in the form of a legal document which holds the firms together. Informal alliances, on the other hand, are held solely by a verbal agreement between the two parties. In contrast to the other types of partnerships described previously, the partners retain their corporate identities and make major commitments to safeguard their unique cultures, skills and independence. The strategic alliance therefore does not exist as a formal organisation, but as a system of interpartner roles and responsibilities supported by a boundary-spanning network of co-ordination, liaison and decision-making linkages (Achrol and Scheer, 1990). The term 'strategic' implies that the partnership has a long-term perspective, a focus on a sizeable and important market and provides the companies with new capabilities (Hartnell, 1994). Equity purchases may occur; however, their involvement goes beyond the reaping of financial benefits. Instead, the equity stake is meant to cement the relationship together. Though equity stakes do not allow the investor to affect its partner's policies for its own interests exclusively, it can allow partial control over the partner in case the equity investment is substantial. Strategic alliances in the airline industry are discussed extensively in Chapter 4.

2.2.4 Vertical alliances

Supplier-manufacturer and manufacturer-distributor collaborations are vertical partnerships whereby the parties involved develop certain exclusive ties so as to benefit from a number of advantages, mainly economies of scale and access to markets without having to develop their own distribution channels. In the airline industry, vertical alliances have mostly been between airlines and travel and tourism companies such as hotel chains, car hire firms, and travel agents. Another type of vertical co-operation is between tour operators, travel agents and charter airlines. Broad-based enduring alliances with airframe or engine manufacturers have however been scarce. Burton and Hanlon (1994) note that vertical alliances in the airline industry have generally been unsuccessful because they consume large amounts of the airlines' capital and managerial resources. Indeed, during the recent economic downturn, many airlines had to abandon their non-core businesses in order to survive. Air France, for instance, divested from the Meridien hotel chain.

The different types of alliances which have been discussed are illustrated in Figure 2.1. This figure inherently classifies the alliances as either horizontal or vertical. However, the difference between the various alliances is deeper and more fundamental. Indeed, other more meaningful parameters differentiate between the types of interfirm agreements listed. In the next sections, these defining dimensions and the classifications which they yield are presented.

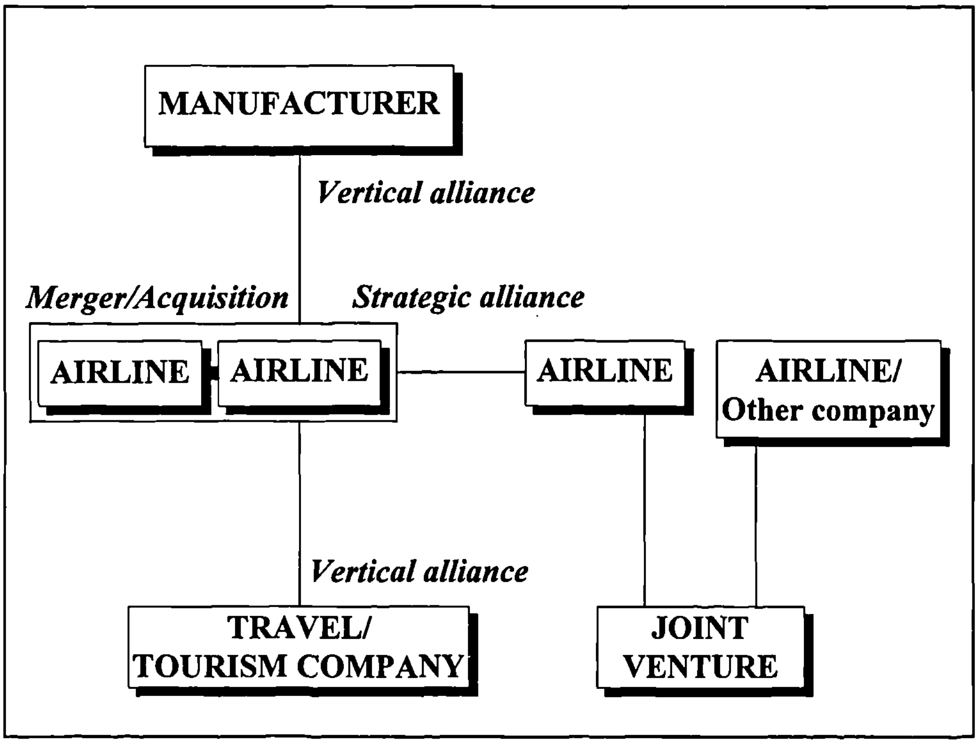


Figure 2.1 Types of airline partnerships
Adapted from Cravens and Shipp (1993)

2.3 Alliance Classifications

2.3.1 Linear classifications

Horizontal arrangements have usually been viewed as business relations lying between the twin pillars on which contemporary social science rest: markets (where resources are allocated through bargaining over price) and hierarchies-total internalisation (where resources are allocated through authority relations and where co-ordination is achieved internally by managerial orders, commands, bureaucracy and strategic plans) (Thorelli, 1986; Powell, 1987). Such a classification gives, what Burton (1994) calls, 'the linear continuum model' of the relationship between markets, hierarchies and alliances. The model is shown in Figure 2.2.

In Figure 2.2, the alliances are classified according to the degree of integration which decreases from the 'hierarchy' end to the 'market' end. Mergers and acquisitions entail total integration of the firms. Hence, this alliance type lies closest to the hierarchy end of the spectrum. Joint ventures are designed to fulfil specific functions and co-operation is only between the departments which specialise in those functions. The level of integration is therefore lower than in mergers.

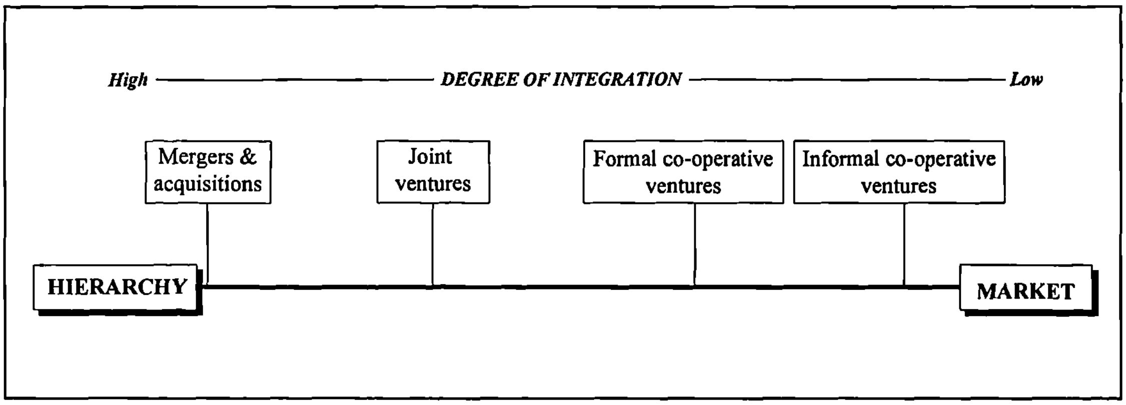


Figure 2.2 Alliance classification in terms of level of integration
Adapted from Lorange and Roos (1993)

Strategic alliances are even closer to the market end of the alliance spectrum as the co-operating firms strive to keep their identities and limit the level of integration to specific operations.

Contractor and Lorange (1988) also adopt the linear continuum model though the defining parameter is the degree of interdependency between the firms involved (see Figure 2.3). Strategic alliances can here be observed to involve a low degree of interdependency between the partnering firms. Airline alliances are a case in point. Indeed, in none of the airline alliances existing today between major airlines will the partners depend on each other for core resources or to such an extent as to be disabled were their partner to go out of business.

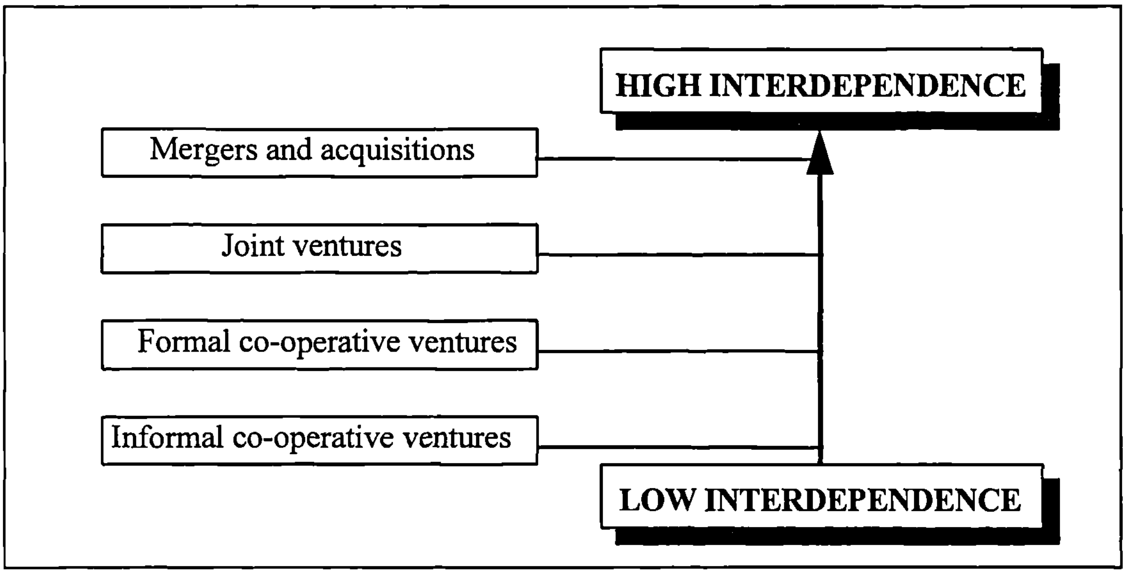


Figure 2.3 Alliance classification in terms of level of interdependence
Source: Contractor and Lorange (1988)

2.3.2 Matrix classifications

Lorange and Roos (1993) argue that an inherent assumption in the two previous classifications is that the partners attach the same importance to integration and interdependence, that is they have a commonly shared vantage point. According to them, this assumption is erroneous; each partner has its own perspective regarding its strategic position which is likely to differ from the other party's perspective.

This can lead to diverging views on the integration issue and on the amount and types of resource interdependencies to be striven for. They therefore propose an alternative classification scheme based along two dimensions: how much resources the partners are prepared to invest into the alliance and how much to retrieve from it. The amount of resources input may be sufficient either for short-term or long-term operation of the alliance. As for the output generated by the alliance, it may either be taken by the partners or be retained by the alliance itself and reinvested in its operations. The emerging classification framework is depicted in Figure 2.4.

		Parents' input of resources	
		Short-term operations	*Long-term operations*
Output retrieval	*To parents*	**AD HOC POOL**	**CONSORTIUM**
	Retained	**PROJECT-BASED JOINT VENTURE**	**FULL-BLOWN JOINT VENTURE**

Figure 2.4 Matrix classification of partnerships (I)
Source: Lorange and Roos (1992)

A criticism that can be made about this classification is that it limits itself to four archetypes of partnerships which are in effect variations of the joint venture. No mention whatsoever is made of formal and informal co-operative alliances. Some improvement to that effect is brought about by Cravens and Shipp (1993) who provide a similar matrix classification framework. In this case, the whole spectrum of partnerships is included and the dimensions which differentiate between the alliances are the environmental turbulence and the skill/resource gaps. Cravens and Shipp (1993) argue that increases in those two influences lead companies to adopt alliances as a strategic tool. The interaction of the two influences is depicted in Figure 2.5.

Environmental turbulence refers to rapidly-changing conditions to which firms find difficult to adapt. Environmental diversity, on the other hand, refers to differences between the elements of an environment, those elements being people, organisations and social forces (Achrol, 1991). Cravens and Shipp (1993) state that when companies are confronted to environmental turbulence and diversity, they can respond by either altering their internal organisation structures or by partnering with other firms. When skill or resource gaps are identified, the company can either purchase them through acquisitions/mergers or have access to them via alliances.

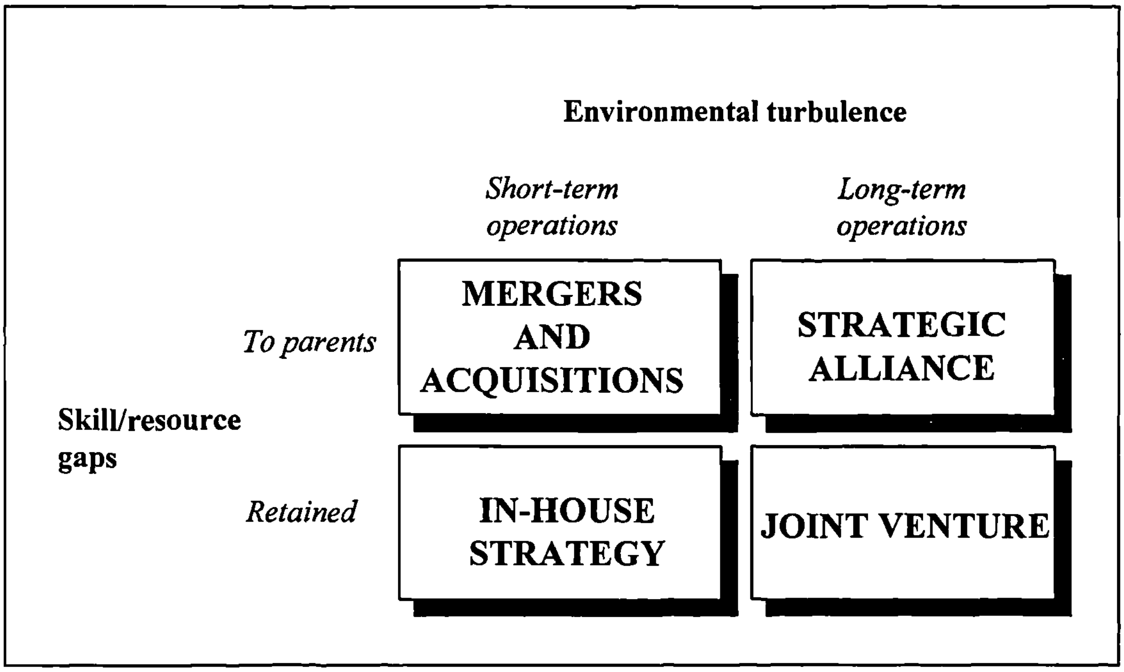


Figure 2.5 Matrix classification of partnerships (II)
Source: Cravens and Shipp (1993)

Faulkner (1995) improves on the two-dimensional classification by adding a third dimension: the number of partners involved in the alliance. As the number of partners increases beyond two, a consortium is created. This kind of partnership is useful in the management and completion of large-scale projects. A well-known consortium in the aviation industry is Airbus involving Aerospatiale, Deutsche Aerospace Airbus, British Aerospace and CASA.

2.3.3 Alternative classification

Burton (1994) also criticises the 'linear continuum model' of alliances and comes up with an alternative classification which he terms 'the business relations triangle' (see Figure 2.6). His argument is that alliances are conceptually different from markets and hierarchies in that they involve significant amounts of relational exchange. Indeed, while markets and hierarchies rely exclusively on transactions and contracts (transactional exchange), the additional element of trust comes into alliances to prevent opportunistic behaviour and exploitation from occurring. For that reason. alliances have to be conceived '...as conceptually distinct entities, based on different foundations, and raising different problems, to either markets or hierarchies....' (Burton, 1994; p. 29).

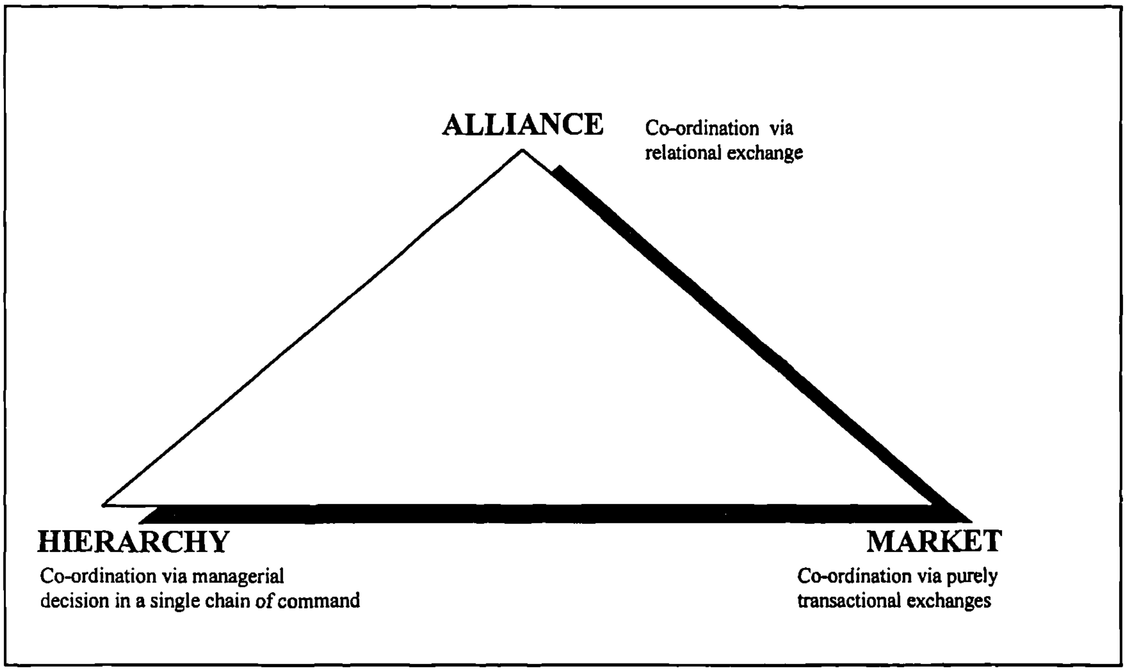


Figure 2.6 Burton's business relations triangle
Source: Burton (1994)

2.4 Classification of Airline Alliances

Which classification adapts itself best to airline alliances, and where are the latter situated on the spectra defined by the differentiating dimensions? To answer this question, one needs to identify the various airline alliance types in existence. This is done in greater detail in the subsequent chapters. However, at this stage, most airline alliances can be considered to fall into the broad category of formal and informal co-operative ventures. Indeed, due to regulatory barriers characteristic of the airline industry, it is difficult for airlines from different countries to merge (see Chapter 5). and joint ventures are not popular among airlines. The airline alliances are best defined in terms of the degree of integration between the partners. At one extreme is the KLM-Northwest alliance which benefits from antitrust immunity[7] and in which the partners try to integrate their products as much as possible without however losing their individual corporate identities. At the other extreme are a large number of loose agreements which consist of code-sharing or block-spacing on only one route (for example, the block-spacing agreement between Virgin Atlantic and Delta Airlines). Thus, it would seem that the linear continuum alliance model best fits the current airline alliances.

2.5 Conclusion

The term 'strategic alliance' is very often used loosely to identify any type of interfirm agreement. However, a strategic alliance is in fact a certain type of co-operation whereby the partners integrate their operations to varying degrees without however merging and losing their corporate identities. Strategic alliances are very common in the airline industry where majority stakes taken by foreign interests are generally considered inadmissible.

Airline mergers have confined themselves to domestic markets. Joint ventures do exist in the airline industry; however, they are in very small number. Vertical alliances between manufacturers and airlines are also in small number and do not live long. Most common of vertical alliances are those in the charter industry, between tour operators, travel agents and charter airlines. Current airline alliances are mostly of the formal or informal types and vary in the level of integration of the parters' activities.

Having identified the various alliance types, the following chapter will analyse the evolution of co-operation in the airline industry. This will show that different types of alliance were favoured at different times, the type selected depending mostly on the socio-economic and political climate prevailing at that particular time.

[7] See Chapter 4.

3. PAST CO-OPERATION IN THE AIRLINE INDUSTRY

Introduction

Co-operation is not an entirely new concept to airlines. Houtte (1993, p. 275) even argues that '...widespread co-operation is one of the main characteristics which distinguishes the airline industry from most other sectors of the economy.' Indeed, ever since the inception of the airline industry, airlines have co-operated with each other to various degrees of collaboration. In certain cases, they have even been forced to do so by regulatory bodies. Inter-airline co-operation is effectively the result of the tight regulatory framework within which airlines had, and still have to, operate.

The purpose of this chapter is to review the types of airline agreements which have prevailed in the past. The factors which have influenced the particular choices of partnerships are examined. This will provide a suitable background allowing one to visualise how the current airline alliances are different from the ones which existed previously. The chapter is divided into two main parts. The first part addresses the issue of mergers which occurred in the airline industry in the past. The second part considers other airline collaborative ventures which have not reached the high level of integration characteristic of mergers. This part is further subdivided into commercial and non-commercial agreements.

3.1 Total Integration

In sharp contrast to other industries, mergers between airlines can only occur on a regional basis. This is because of current regulations which have their roots mainly in nationalism. Airline mergers first occurred in the US in the period following deregulation. The industry consolidation which ensued was very rapid. Mergers in the rest of the world occurred at a much slower pace and the impact on the industry in the various regions was not as far-reaching as in the US. This is because no other market approaches the size of the US and is able to support the number of carriers operating there. In the African and Latin-American regions, airline mergers were virtually inexistent. The following sections examine airline merger trends and analyse how they were related to political environments prevailing then.

3.1.1 The US pre-deregulation period

Airline co-operation in the US can be traced as far back as the 1940's when the Civil Aeronautics Board (CAB) was in existence. At that time, the US air transport industry was highly regulated with airlines classified by the CAB as either trunk, local service and commuter carriers. Each carrier type was assigned to a particular type of market and it was practically impossible for carriers to switch from one market type to another. Trunk carriers operated the medium to long haul interstate routes; local service carriers operated the low density routes to the small- to medium-sized communities, and the commuter airlines served the very small communities. Owing to the CAB restrictive policies, most US airlines had linear route structures which did not allow them to practice self-feed. Therefore, feeder agreements between the small carriers serving the low-density markets with the turboprop aircraft and larger airlines operating the jet aircraft proliferated and were encouraged by the CAB (Pickrell, 1991).

3.1.2 The US post-deregulation period

After airline deregulation which occurred in 1978, the situation changed dramatically. Initially, the number of competitors to the trunk carriers increased as the local service and commuter carriers entered long-haul routes. However, this general increase in the level of competition was brought to an end at around 1984 when a wave of airline failures and mergers hit the industry. Fifty-one airline mergers took place between 1979 and 1989 (Dempsey and Goetz, 1992) with the principal merger period lying between 1984 and 1989 (Graham, 1995). Figure 3.1 shows the major airline mergers which occurred in the US since 1978.

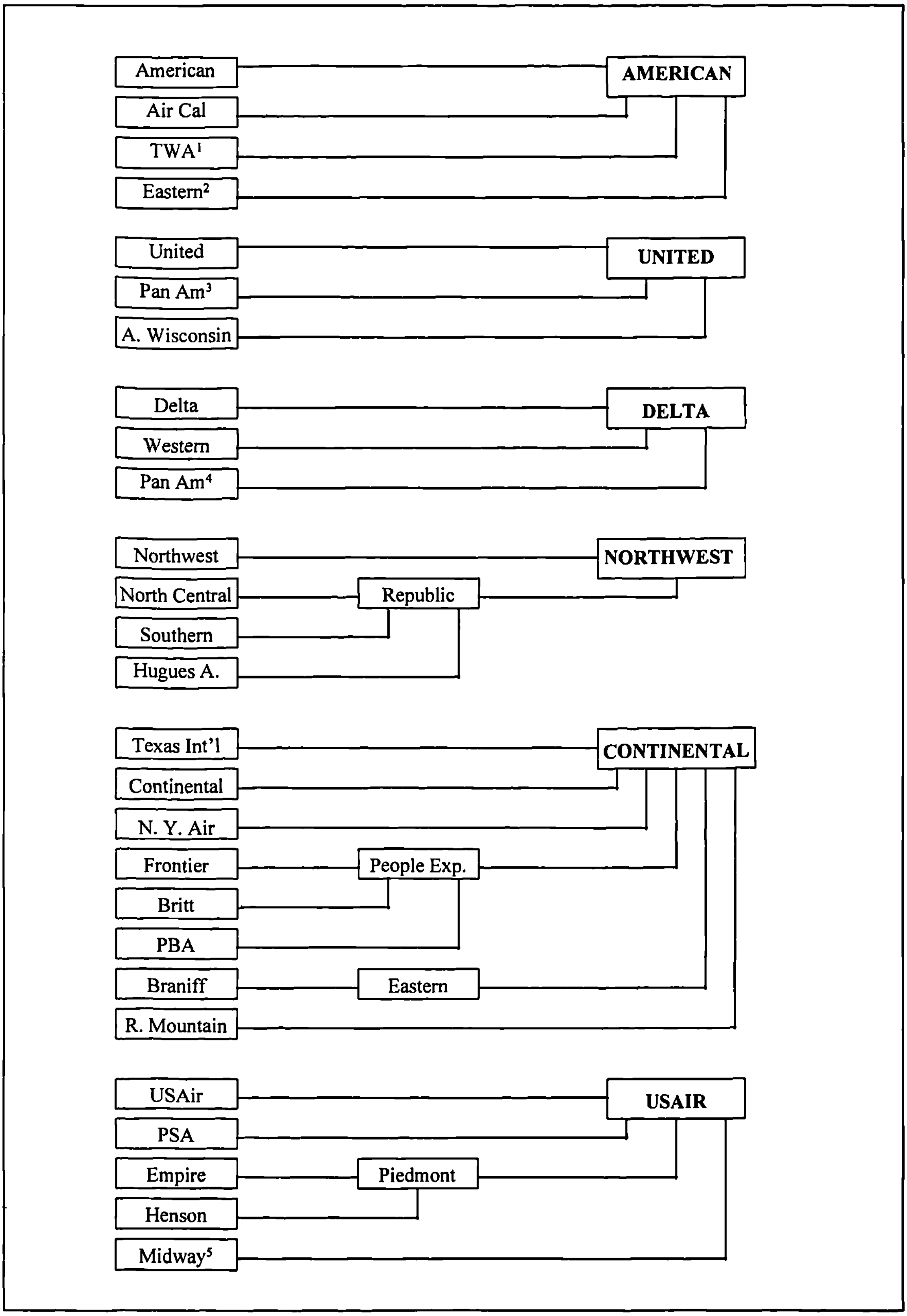


Figure 3.1 Major airline mergers after US deregulation

Source: Dempsey and Goetz (1992), p. 49

Notes:

[1]London routes, [2]Latin-American routes; [3]Transpacific, Latin American and London routes; [4]European routes and N. Y. shuttle; [5]Philadelphia gates and Canadian routes

The mergers were driven mainly by the need to grow which was believed to carry with it economic efficiency via economies of scale, scope and density, lower production costs and market power.

Hub-and-spoke networks which replaced the linear route structure after deregulation were also responsible for the industry consolidation. Airlines realised that hub domination was a requisite for market power and merged with competitors operating at their hubs both to achieve quasi-monopoly status and to eliminate competition. This was apparent in the Northwest/Republic and Trans World/Ozark mergers where the merging carriers were the two largest competitors at the Minneapolis/St. Paul, Detroit and St. Louis airports (Wells, 1989). Airlines also realised that they needed multiple hubs located at strategic positions in order to offer a comprehensive network of services throughout the US to consumers. Rather than incurring the costs of developing the hubs themselves, they preferred to acquire those of the other airlines via mergers (Williams, 1994). Another driver to consolidation is the financial distress which many airlines (such as Eastern, People Express and Frontier) got into after deregulation. The substantial assets of these airlines combined with their depressed values made them attractive take-over targets for other airlines (Pickrell, 1991).

The increase in merger activity during that period was greatly helped by the extremely pro-merger policy adopted by the US Department of Transportation (DoT) after it assumed the CAB's jurisdiction over mergers, acquisitions and consolidations on December 31, 1984. So much that the DoT has been qualified as the department '...that never met a merger it didn't like' (Jennings, 1996a; p. 74)

After the linear route structure was replaced by the hub-and-spoke system, US airlines realised the importance of traffic feed to increase load factors on flights departing from hubs. Therefore, it was important for them to gather the traffic from small communities at their hubs. However, it was not viable for the trunk and former local service carriers to serve the thin routes from those communities with their large jet aircraft. Furthermore, they lacked the necessary expertise to operate in these market types. In order to secure traffic feed, they formed marketing alliances with small carriers operating the appropriate aircraft types. In most cases, code-sharing[8] formed part of the agreement, and the smaller airlines usually carried the name and livery of their larger partners. Some US majors (for example, American Airlines) preferred to own their feeder commuters outright. At the beginning of 1983, the number of major-regional code-share agreements stood at 10. As at January 1, 1985, the number had risen to 17 and in 1986, there were 60 code-share agreements (Oster and Pickrell, 1987). Currently, nearly all US commuters are aligned to one or more major airlines and carry their codes. Table 3.1 lists some of those tie-ups.

Major	Code-share partner
Continental Airlines	*Continental Commuter*
	Continental Express
	GP Express
	Skywest Airlines
	Frontier Airlines
American Airlines	*American Eagle*
	Simmons Airlines
	Flagship Airlines
	Wings West Airlines
	Executive Airlines
Delta Airlines	*The Delta Connection*
	Atlantic Southeast Airlines
	Comair
	Business Express Airlines
	Skywest Airlines
	Scenic Airlines
USAir	*USAir Express*
	Piedmont airlines
	Mesa Airlines
	Allegheny Commuter Airlines
	Trans States Airlines
	CC Air
	Jetstream International Airlines
	Trans World Express
	Chautauqua Airlines
	Commutair
United Airlines	*United Express*
	Mesa Airlines
	WestAir Airlines

Table 3.1 US majors' commuter partners
Source: Humphreys (1994b), ABC Guide (June 1994)
Note: Common brand identity in italics

[8] Code-sharing is examined in detail in Chapter 6.

Major	**Code-share partner**
United Airlines (*cont'd*)	Air Wisconsin Atlantic Coast Airlines Great Lakes Aviation
TWA	*Trans World Express* Trans States Airlines Trans World Express Air Midwest Resort Air Resort Commuter
Northwest Airlines	*Northwest Airlink* Mesaba Aviation Horizon Airlines Trans States Airlines Business Express Express Airlines

Table 3.1 (*cont'd*)

3.1.3 The European experience

As already mentioned, the number of mergers which occurred in Europe is much lower than in the US, mainly because of Europe's fragmented political structure and stringent regulations. The three main airline mergers in Europe involved British Airways-British Caledonian, British Airways-Dan Air and Air France-Air Inter-UTA. The acquisition of British Caledonian (BCal) by British Airways occurred in 1988. It was approved by the European Commission even though it resulted in high market shares on individual routes and airports. British Airways' rationale for the merger was the acquisition of BCal's routes to southern US, Middle East and Europe, and to foreclose competition from SAS in the UK (Stodden, 1988). In acquiring BCal, British Airways increased its power in the UK marketplace. Its position was further strengthened when it took over Dan Air. That acquisition was not examined by the European Commission as Dan Air's turnover was less than ECU 250 million per year.

Air France acquired UTA, and at the same time, Air Inter in 1990. These formed part of Air France's attempts to create a single entity which would dominate the French marketplace and be in a better competitive position when European Liberalisation occurred. The European Commission approved the merger on the conditions that Air France sold its shares in TAT, relinquished slots at Paris Charles de Gaulle airport, and allowed at least one other French carrier to serve about half of all internal French routes. According to a Cranfield study (1996), the third condition has not been fulfilled.

The Third Package of Liberalisation introduced in January 1993 effectively replaced national ownership by the concept of Community ownership. Theoretically, this meant that airlines in the European Union could merge. However, theory does not seem to have been followed by practice. The only substantial stakes taken by one airline into another are those of British Airways into TAT (49.9%), DeutscheBA (49%), SAS-British Midland (40%) and KLM-Air UK (45%). Two possible explanations can be offered for this state of affairs. First, European airlines are only starting to recover from the effects of the economic recession. They may therefore not have the financial resources enabling them to buy out other airlines. Second, the merger of airlines from different European countries has implications for the bilateral agreements which the airlines involved have with third countries. Indeed, a third country could revoke its bilateral agreement with a European country whose airline has been taken over under the pretext that it is not substantially owned and majority controlled by the citizens of that state[9].

3.1.4 The Asian/Pacific experience

Airline mergers in the Asian-Pacific region have been very sparse mainly because of tight regulatory controls. Governments in those regions also favour the separation of markets into the domestic and international categories which are then operated by separate carriers. That was the case of Australia where Qantas was allocated the international routes while Australian Airlines and Ansett operated domestically. However, in 1992, the Australian Government allowed the merger of Qantas and Australian Airlines to go ahead. The surprise decision came as the government tried to clear itself of a political morass and to bring the country's high budget deficit to

[9] The implications of bilateral agrements on cross-border mergers are examined in greater detail in Chapter 5.

acceptable levels (Deans, 1992). Another similar merger occurred in Thailand when Thai was permitted to merge with the domestic carrier, Thai Airways.

3.2 Partial Integration

Owing to the tight regulatory controls which eliminate the possibility of cross-border mergers, airlines have been forced to collaborate along only certain lines to benefit from economies accruing from size and to extend their networks. Co-operation can be classified as either commercial or non-commercial, though some overlap does exist between the two categories. On the commercial side, the most prevalent type of co-operation which is still in existence today is interlining. Non-commercial collaboration usually translates into the pooling of resources and technical co-operation. Common to both the commercial and non-commercial aspects of co-operation is the joint development and ownership of Computer Reservations Systems (CRS). Unlike total integration which confined itself to the US and Europe, partial integration of operations took place between airlines all over the world. Each of the items of collaboration are considered next.

3.2.1 The interline system

The major outcome of the Paris Convention in 1919 is the official recognition that states have sovereign rights in the air space above their territory. As a consequence, airlines were confined to their home states and their governments had to negotiate with governments of other countries to allow their operation between the two countries concerned. The global networks of airlines were therefore very limited and it would have been impossible for them to offer passengers and shippers a world-wide transport system without the interlining system. This particular system consists of agreements as to the sale, endorsement and acceptance of tickets between airlines so that passengers and cargo can transfer from one airline to the other on the way to the final destination.

Parallel to the interlining system runs the International Air Transport Association (IATA) multilateral forum for the co-ordination of tariffs on a world-wide basis. This allows international tariffs to be developed and leads to a more homogeneous tariff structure in which all airlines offer comparable products. In addition, co-ordination of tariffs allows airlines to maintain artificial relationships between tariffs on routes to nearby points and between tariffs on direct and indirect services. However, this procedure can be anti-competitive and is sometimes allowed only under specific conditions (Houtte, 1993).

The interline system used to be viewed as a very important constituent of international air transport (Taneja, 1984). However, in the new types of alliances, partners interline preferentially with each other via code-sharing. With the increasing number of code-sharing agreements being sealed[10], the interline system seems to be under threat and is gradually disappearing.

3.2.2 Pooling

Pooling, also known as joint operation, is a commercial agreement between two (or more) airlines whereby only one airline operates the service and its partner shares in both the costs and risks of that service. Doganis (1991) identifies two types of pooling that were prevalent in the airline industry: the revenue-cost pool and the revenue-sharing pool. In the revenue-cost pool, only one airline operates the service and the costs and revenues are shared between the partners according to a pre-arranged formula. In the revenue-sharing pool, all the airlines in the partnership operate the service and the total revenue is shared among them according to the capacity they offer on the route. Examples of pooling agreements which existed in 1990 are British Midland-Sabena on the Birmingham-Brussels route and Aer Lingus and Lufthansa on the Dublin-Manchester and Birmingham-Frankfurt routes.

The main advantage of pooling comes in the control of frequency and capacity and the avoidance of predatory pricing (Grumbridge, 1966). Weak carriers are ensured of survival as they are guaranteed of their share of capacity and revenue especially when they are competing with a stronger carrier. Pooling also allows the partners to rationalise their schedules such that departing flights are not grouped at peak times, but

[10] See Chapter 4.

distributed evenly throughout the day. This type of co-operation is particularly useful when the market is too thin for the viable operation of more than one carrier.

Pooling agreements have been outlawed in the US under the Sherman and Clayton antitrust acts[11] because of their potential for anti-competitive behaviour. In Europe, most airlines gave up their pooling agreements after the First Liberalisation Package in 1987 (Doganis, 1991). This is because the European Commission restricted pooling to routes which were not previously operated by the parties or by other airlines, and to low density routes[12]. Furthermore, the operating airline must not have a strong presence in the market in the catchment areas of the airports involved[13] and it must be relatively small[14]. Revenue pools were considered as anti-competitive by the European Commission which set stringent rules as to the amount and direction of the transfer of revenue. These restrictions made pooling unattractive to European airlines and lead to the gradual phase out of this type of co-operation.

3.2.3 Technical collaboration

Most common areas of technical co-operation are listed in Houtte (1993). They are summarised as.

(1) The introduction or uniform application of mandatory or recommended technical standards for aircraft, aircraft parts, equipment and aircraft supplies;

(2) The introduction or uniform application of technical standards for fixed installations for aircraft;

(3) The exchange, leasing, pooling and maintenance of aircraft, aircraft parts, equipment and fixed installations, and the joint purchase of aircraft parts;

(4) The introduction, operation and maintenance of technical communication networks;

(5) The exchange, pooling or training of personnel for technical or operational purposes;

[11] See Chapter 4.
[12] Capacity below 30,000 seats per year in each direction, or below 60,000 on longer routes.
[13] Less than 90,000 seats per year.
[14] Community turnover of less than 400m ECU.

(6) The organisation and execution of successive or supplementary air transport operations;

(7) The consolidation of individual consignments.

In Europe, two main airline consortia, ATLAS and KSSU were created around twenty-five years ago to take the maintenance and overhaul of the fleets of the constituent airlines in charge. These consortia achieved extensive collaboration in aircraft and engine maintenance. They are quite interesting cases of airline technical co-operation and it is worth examining their development and operation in some detail.

3.2.3.1 The ATLAS consortium

The ATLAS maintenance consortium was created in 1969 and comprised Air France, Alitalia, Iberia[15], Lufthansa and Sabena. The need for such a maintenance and overhaul grouping arose with the arrival of wide-bodied aircraft such as the Boeing 747 and McDonnell Douglas DC-10. The airlines realised that undertaking the maintenance of those aircraft individually would be extremely expensive. The creation of a consortium would allow them to spread the cost of the capital outlay by allowing individual members to specialise. Economies of scale would be reaped as buildings, facilities and labour were utilised optimally, and investment costs for spares would be reduced. The division of responsibility in the ATLAS consortium is given in Table 3.2.

Since its creation, the collaboration between the airlines has brought substantial benefits to all of them. However, the ATLAS group was recently disbanded because the partners reached the adequate size and acquired the necessary level of expertise to perform the maintenance and overhaul work on their own. The downside of co-operation was also becoming more important. Such disadvantages included the increasingly cumbersome decision-making processes, and the increasing transportation and communication costs, as well as the very long-term commitment. However, co-operation in maintenance and overhaul is still being practised by the members of the

[15] Iberia joined the group in 1972.

ATLAS consortium, though at a bilateral level, and the possibility of reconstituting the group still exists (Reed, 1994a).

Airline	Responsibility
Air France	Boeing 747 maintenance Production centre for A300 maintenance Component holding for Boeing 747 Maintenance of GE CF6 engines
Alitalia	DC10 maintenance APU 700 maintenance Component holding for Boeing 747 Component holding for DC10, A300 and A310
Iberia	Production centre for Boeing 747 maintenance P&W JT9D-7Q and Olympus engine overhaul Component holding for DC10, A300 and A310
Lufthansa	A300 maintenance P&W JT9D-7A overhaul Component holding for DC10, A300 and A310
Sabena	A310 maintenance P&W JT9D-7R maintenance APU maintenance Component holding for Boeing 747 Component holding for DC10, A300 and A310

Table 3.2 Division of responsibility in the ATLAS consortium
Extracted from Aviation Week & Space Technology, February 8, 1988 and Air Transport World, November 1994

3.2.3.2 The KSSU consortium

Origins of the KSS maintenance and overhaul consortium can be traced back as far as 1958 when SAS and Swissair decided to co-operate on the maintenance of DC-8s, Caravelles and Coronados. The aircraft were jointly specified to facilitate maintenance functions. The consortium was officially formed in 1969 when KLM joined in. In 1970, the group was enlarged with the adherence of UTA and was renamed KSSU. However, it reverted back to KSS when Air France took over UTA in 1990. Maintenance of the Boeing 747, DC-8 and DC-9 was distributed among the partners. The division of responsibility in the KSSU group is given in Table 3.3.

Airline	Responsibility
KLM	Boeing 747 maintenance GE CF6 maintenance
SAS	P&W JT9D maintenance
Swissair	General overhaul of fuselage MD-11, DC-10 and A310 maintenance
UTA	Maintenance of undercarriages of wide-body aircraft Overhaul of APUs

Table 3.3 Division of responsibility in the KSSU consortium
Extracted from Aviation Week & Space Technology, February 8, 1988 and Air Transport World, November 1994

Similar to ATLAS, KSS was formed to reduce the outlays of the individual airlines in plant and equipment, while at the same time, developing an expertise in their allocated maintenance functions. Savings are also made via economies of scale in production, reduction in capital costs, and the pooling of spare parts. KSS is still in existence; however, new agreements have recently been signed to update the pricing system applied in the group and to take into account the changes in the airline industry which have occurred since the group's creation. (Reed, 1994a)

3.2.4 CRS development and ownership

Though CRSs were developed in the late 1950s, they started to be used as a competitive weapon about thirty years later. Sabre and Apollo were the first reservations systems and were owned by American and United respectively. As the use of those CRSs by travel agents proliferated, airlines observed that such systems were providing their owners with considerable market power. Among other things, American and United were gaining a considerable amount of confidential information which gave them a competitive edge over those airlines renting their systems. The need was therefore felt for airlines to set up their own reservation systems. However, developing one's own CRS necessitates huge financial investments which most airlines could not spare. Consequently, during the 1980s, a number of airlines co-operated to develop CRSs which would compete with Sabre and Apollo. Worldspan, for example, was the result of co-operation between Delta, Northwest and TWA.

With the globalisation of markets and the growing CRS maintenance costs, extensive technical and marketing links have developed between the existing CRSs. Airlines have also sought to sell off part of the CRSs or merge them with CRSs in other regions of the world. Mergers have also been driven by the substantial economies of scale which CRSs exhibit (Humphreys, 1994a). Galileo International, for example, was formed in 1992 as a result of a merger between Apollo and Galileo. The ownership structure of the CRSs as they stood in 1992 is shown in Figure 3.2.

The market shares of some of the CRSs are given in Figure 3.3 to allow one to gauge their relative strengths. Sabre seems to have retained part of the supremacy it possessed originally. However, it has been overtaken by the Galileo International. The other CRSs have relatively low market shares compared to these two giants, indicating that the CRS industry is a concentrated one. Burton and Hanlon (1994) argue that the trend towards mergers in the travel trade will be a driving force towards further consolidation of the CRS industry. According to Williams (1994) three major global CRSs will eventually emerge.

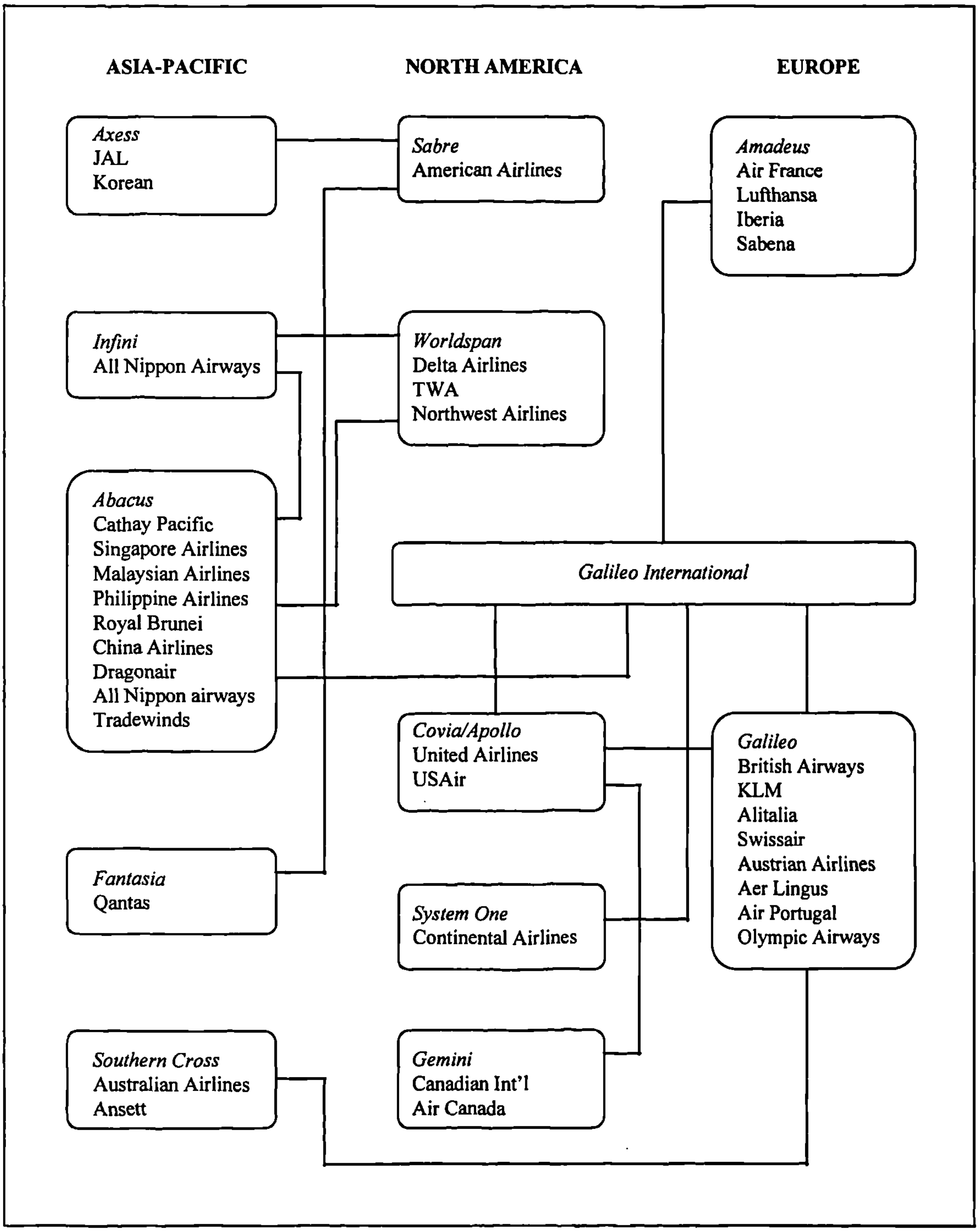


Figure 3.2 Structure of CRS ownership and inter-relationships

Source: IATA (1993)

Note: — marketing/technical links

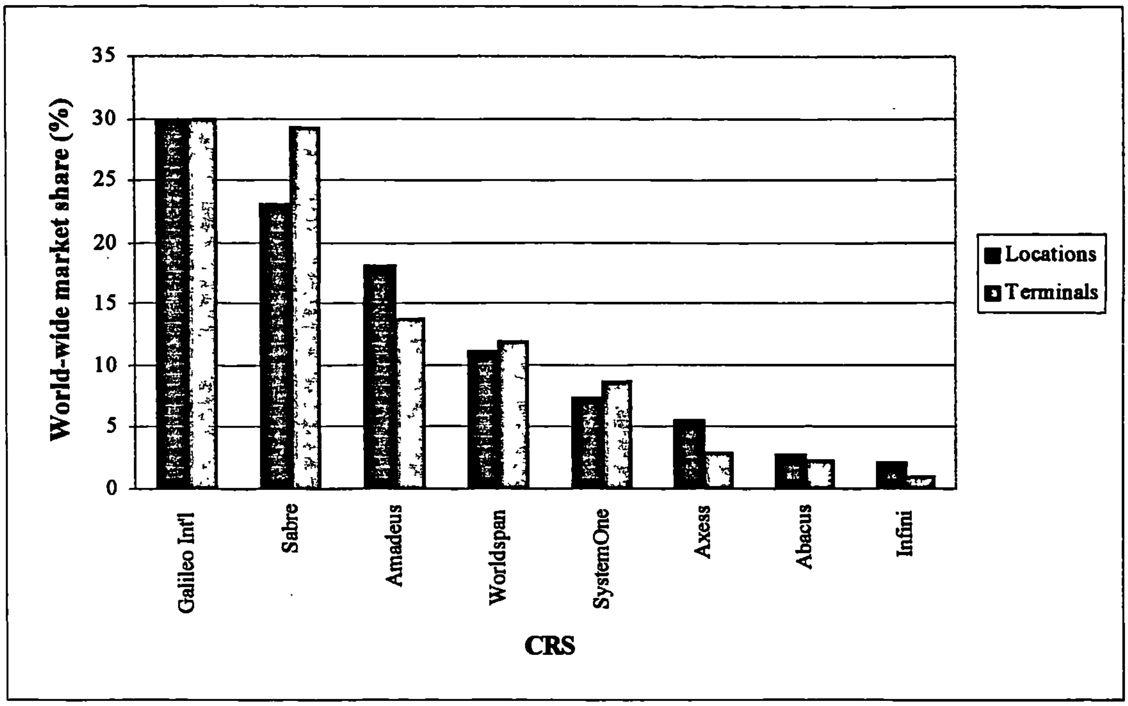


Figure 3.3 Market share of selected CRSs as of September 1993
Data source: Humphreys (1994a)

3.3 Conclusion

This chapter has shown that co-operation between airlines is not a new phenomenon. Airline have integrated their operations to various extents in the past. At one extreme is total integration, the merger. This could only take place within domestic/regional boundaries because of merger regulations which prohibited cross-border mergers. Such regulations are still in existence today. Most airline mergers took place only in the US, and to a lesser extent, in the remaining parts of the world. Mergers in the US were driven by deregulation and the resulting hub-and-spoke route networks. In Europe, the motivation for merging came from the need to dominate markets in preparation for liberalisation.

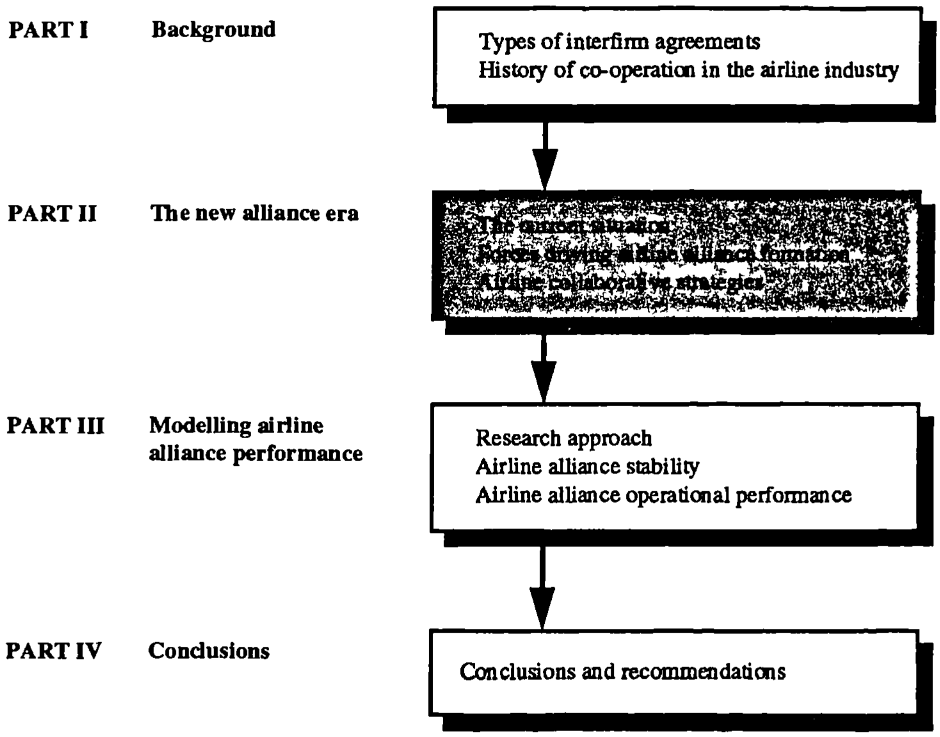
Partial integration of operations is more widespread around the globe. On the commercial side, interlining was, and still is, very common and was encouraged by the regulatory authorities. It compensated for the fragmented structure of the industry. Non-commercial collaboration included pooling of resources and co-operation in technical fields. The high development costs of CRSs has required airlines to co-operate up their reservations systems. The economies of scale which these systems exhibit is encouraging the merger of CRSs based in different world regions.

How are these co-operative ventures different from the airline alliances which are emerging in this decade? What are the factors which have caused airlines to feel dissatisfied with their current alliances and therefore try to co-operate more extensively? These are the questions which will be addressed in the next part of this thesis.

PART II

THE NEW ALLIANCE ERA

This part analyses how the structure of the airline industry differs from what it was five years ago. The current situation is first presented. The forces which have driven airlines to ally are then identified and discussed. Finally, the details of co-operation between airlines are analysed.



4. THE CURRENT SITUATION

Introduction

Since the beginning of this decade, the structure of the airline industry is in a state of flux. With increasing recognition of the value of co-operation, alliances are becoming a common feature of the air transport landscape. These alliances are linkages between the firms at various operational levels. They go beyond the usual interlining agreement to encompass certain marketing and cost-reducing features. The involvement of equity stakes is becoming increasingly prevalent in the partnerships. However, they all fall short of mergers owing mainly to regulatory constraints.

The aim of this chapter is to provide a clear and complete picture of the current airline alliance situation by gathering and analysing the dispersed pieces of information about airline alliances. It is divided into three main parts. In the first part, various statistics based on published surveys are presented to give an idea of the growing importance of alliances in the airline industry. A classification scheme is devised to identify the different types of alliances in existence. In the second part, the strategic rationale for a selected number of alliances are analysed. The degree of success achieved by the alliances and the problems that they are experiencing are presented. The final part of the chapter focuses on the competitive and legislative implications of airline alliances. Treaties and studies which have dealt with the benefits and effects of alliances are also reviewed.

4.1 The Growing Importance of Airline Alliances

Evidence that the trend towards airline alliance formation is gaining momentum is found in surveys carried out by KPMG/IATA, Boston Consulting Group (BCG) and the Airline Business periodical. The KPMG/IATA (1996) survey was carried out among Chief Financial Officers (CFOs) of 24 airlines in 1992 and in 1995. In 1992, only three of them stated that their airline had entered into a strategic alliance with another carrier. By 1995, all of the airlines were strategically linked in some way to another carrier. The results of the 1995 survey are presented in Table 4.1.

Type of relationship	Responses
Code-sharing	20 of 24
Block-spacing	16 of 24
Combined FFPs	17 of 24
Joint marketing relationships	14 of 24
Equity investment in another carrier	14 of 24
Equity investment held by another carrier	11 of 24
Franchise agreement	4 of 24

Table 4.1 Results of KPMG/IATA survey on airline alliances
Source: KPMG/IATA (1996)
Note: The types of relationships are detailed in Chapter 6

Most of the CFOs believed that the airline industry was on a trend towards further consolidation and that the eventual result would be the global domination of five to ten major groupings.

The BCG has tracked the change in the number of airline alliances since 1991. The results of its study are given in Figure 4.1. The total number of alliances[16] doubled in the period from 1991 to 1995 (from 200 to 401), with the increase being more predominant in the domestic and regional sectors. The increase in alliances in the domestic sector stems from the desire by major carriers to secure traffic feed. The large increase in regional alliances can be attributed to the relaxation of national and regional controls regarding airline link-ups. The smallest change occurred in the

[16] Simple interlining agreements are not considered.

intercontinental sector, reflecting the slow pace at which global deregulation is progressing (Lindquist, 1996).

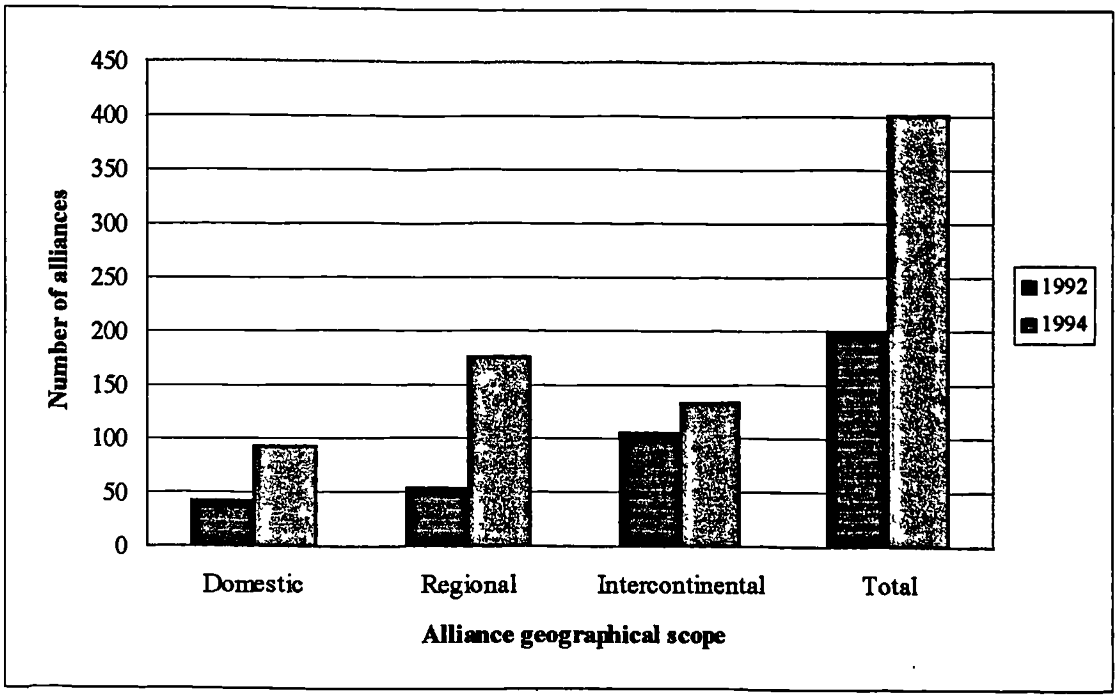


Figure 4.1 Breakdown of airline alliances by geographical scope (1995)
Source: Lindquist (1996)

The Airline Business periodical has also conducted extensive surveys in an attempt to follow the progress of the alliance phenomenon[17]. However, these were commenced in 1994 so that only three editions exist. Nevertheless, they do provide an indication of the rate at which the number of airline alliances is growing. Figure 4.2 shows how the total number of alliances in the world has changed over the period 1994 to 1996. The total number of alliances increased from 280 in 1994 to 324 in 1995 (16% increase) and to 389 in 1996 (an increase of 20% over 1995). The change in the alliance number was brought about both by the increase in the number of alliances per airline and by an increase in the number of airlines adopting the alliance strategy.

[17] These surveys are published in Airline Business, July 1994, June 1995 and June 1996 issues. Only the alliances between major carriers are included.

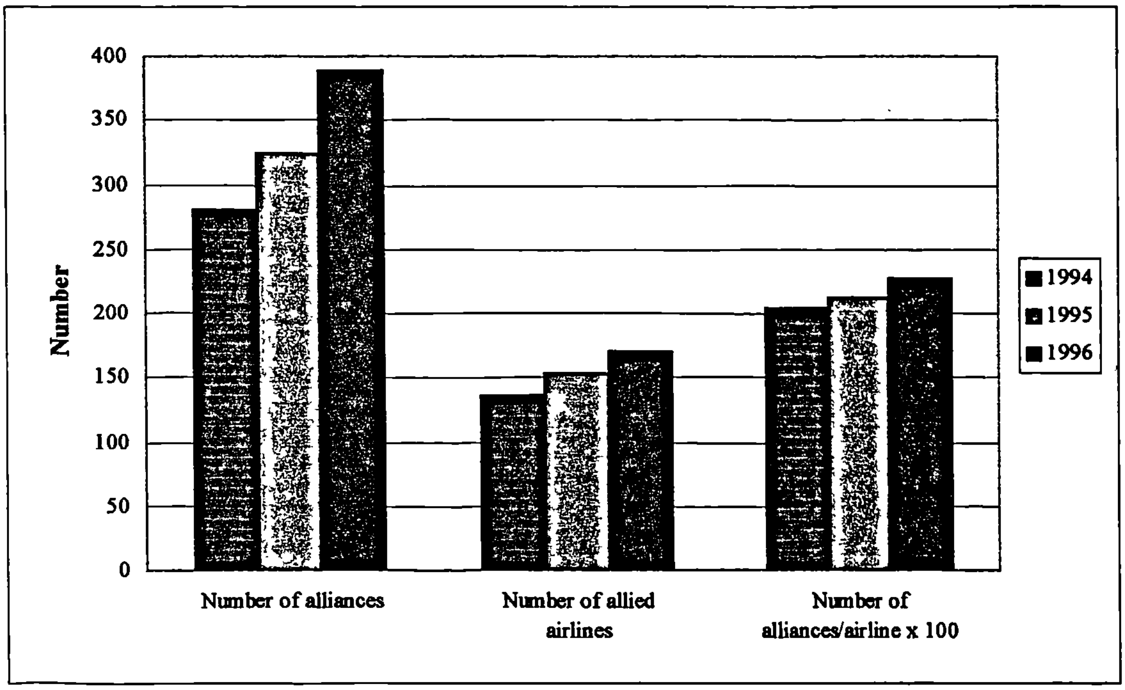


Figure 4.2 Progression of the airline alliance phenomenon
Source: Airline Business, June 1996

Figure 4.3 investigates the progression of the alliance phenomenon at a more disaggregate level.

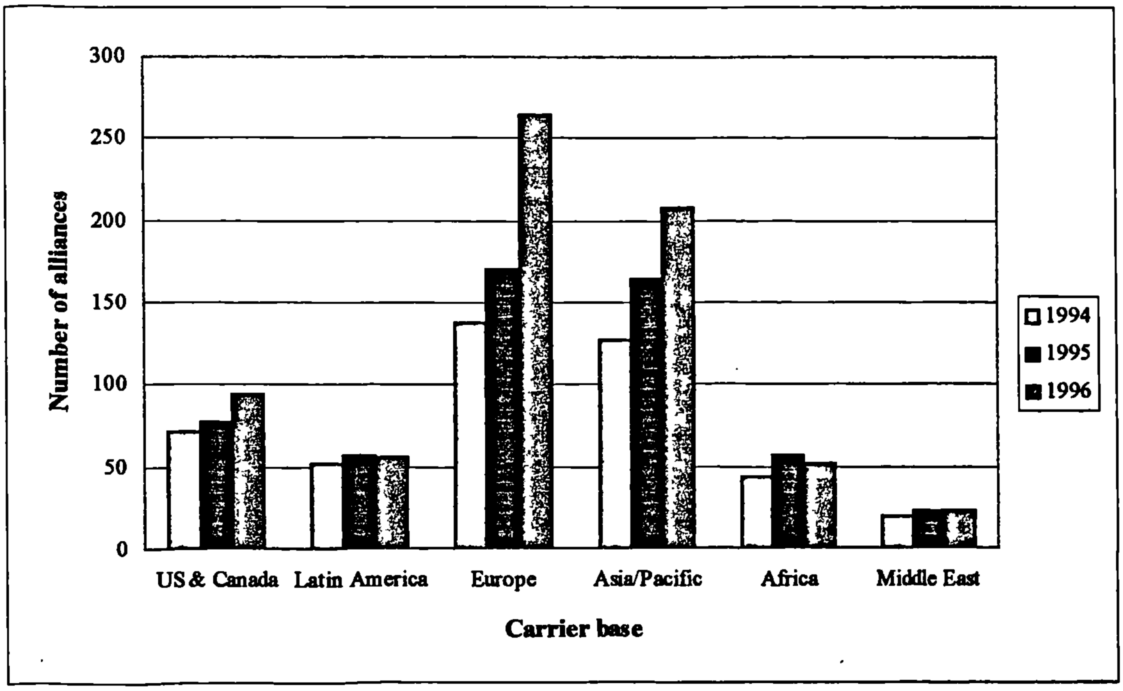


Figure 4.3 Alliance growth by region
Data extracted from Airline Business, July 1994, June 1995 and June 1996 issues

From Figure 4.3, one can deduce that the largest number of alliances involve a European or Asian/Pacific carrier. The largest increase in the number of alliances occurred in Europe from 1995 to 1996, followed by Asia/Pacific and the US. In other world regions, the number of alliances decreased slightly (Latin America and Africa) or remained unchanged (Middle East) over the period 1995 to 1996.

In order to control for the different number of airlines in each region considered, the average number of alliances per airline is calculated. The results are given in Figure 4.4. In terms of alliance activity, two groups can be distinguished. The upper group consists of airlines from US and Canada, Europe and Asia/Pacific. In 1994 and 1995, US and Canadian carriers had the highest number of alliances per airline. However, in 1996, European carriers took the lead with an average of 8.3 alliances per airline as compared to an average of 7.2 for US and Canadian carriers. In third position come Asian/Pacific carriers with an average of 6.3 alliances per airline.

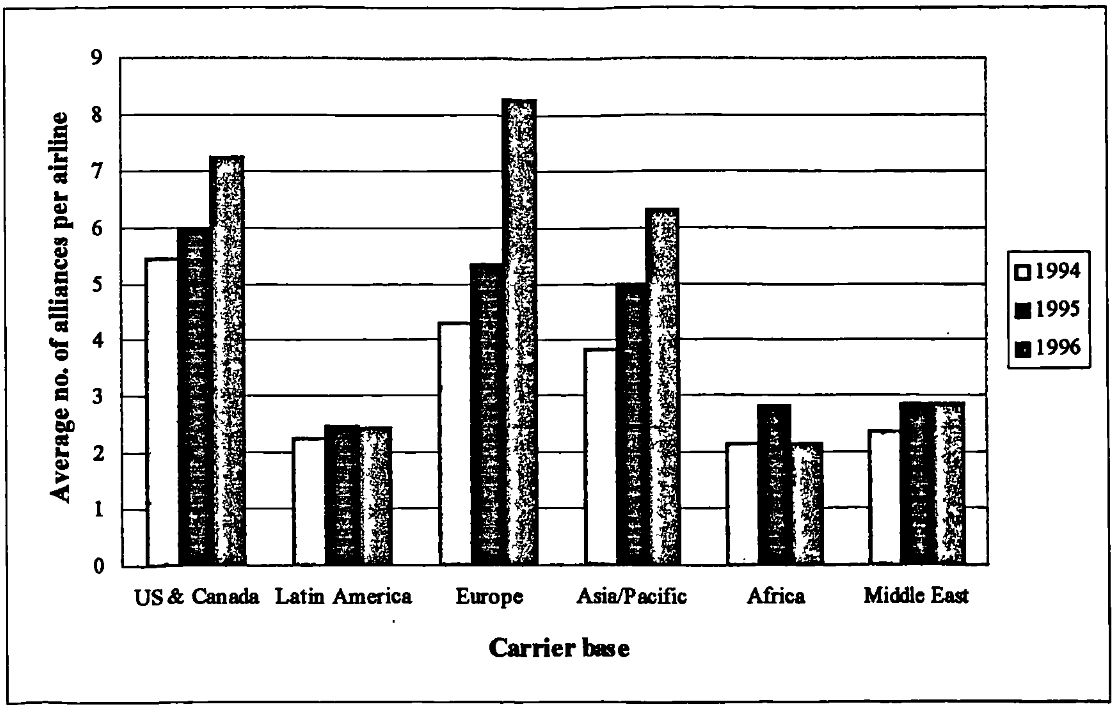


Figure 4.4 Change in the number of alliances per airline
Data extracted from Airline Business, July 1994, June 1995 and June 1996 issues

The lower group includes airlines from the less-developed parts of the world, Latin America and Africa, as well as from the Middle East. Airlines in those regions have an average number of alliances lying in the range 2-3. These results tend to show that the need to go global has not yet been felt by airlines in the lower group. The urge is however very prevalent in the upper group of airlines.

4.2 Airline Alliance Classifications

The above analysis takes a broad view of alliances, that is any linkage between two or more airlines is considered to be an alliance. However, each and every airline alliance differs in terms of nature and content. For a better understanding of airline alliances, a classification scheme based on the scope and type of co-operation, and the degree of financial involvement is devised. The scheme is shown in Figure 4.5.

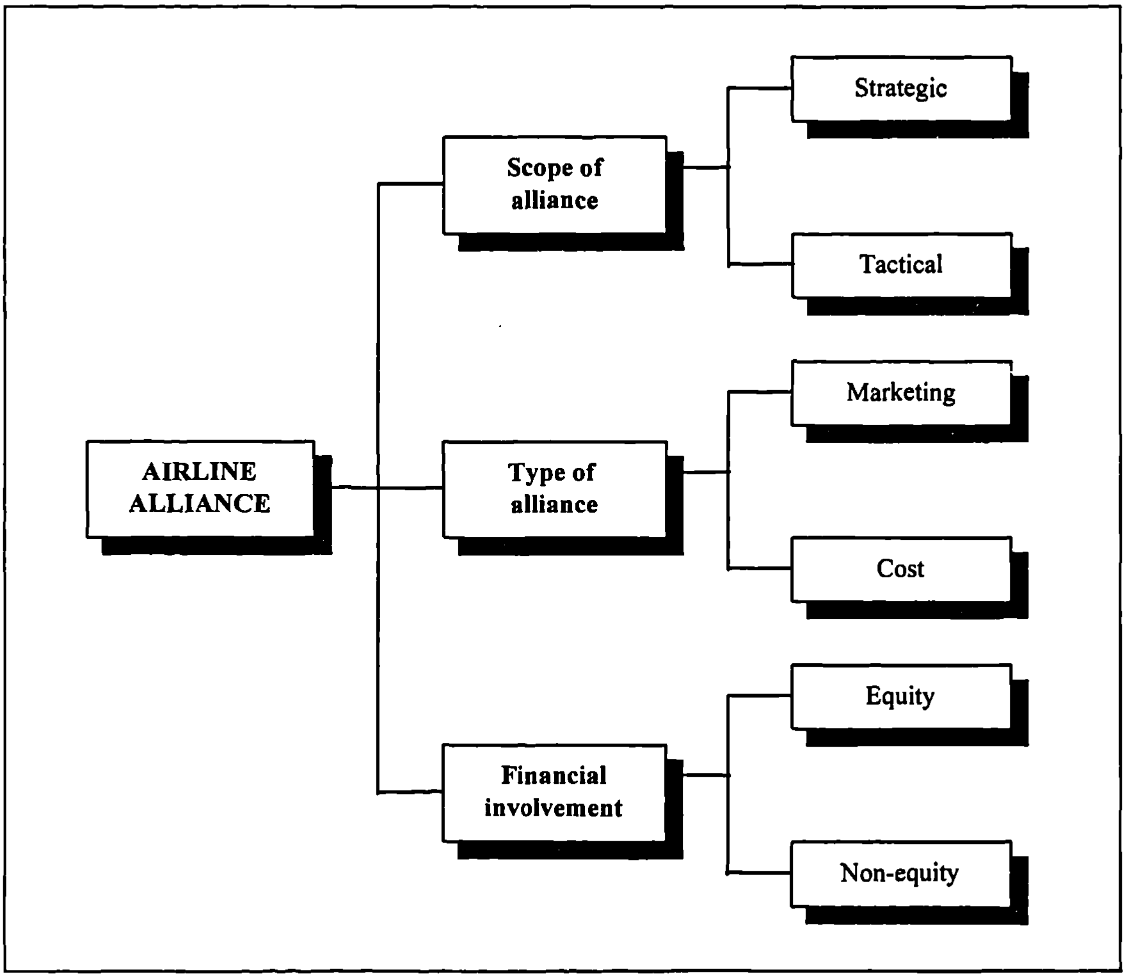


Figure 4.5 Airline alliance classification

4.2.1 Strategic v/s tactical alliances

Strategic alliances are so termed because co-operation exists in a wide range of activities ranging from sales and marketing to purchasing and maintenance. Furthermore, the alliances are designed to give the allies a competitive edge over their competitors and the benefits are expected to be reaped in the long term (Hartnell, 1994). Most notable examples of strategic airline alliances which have been widely documented and commented upon are the EQA consisting of Sabena (which has replaced SAS), Swissair and Austrian Airlines, the Alcazar project which intended to unite KLM with the EQA but which never came to fruition, the Global Excellence with Swissair, Delta and SIA, the SAS-Continental, British Airways (BA)-USAir, KLM-Northwest and Lufthansa-United tie-ups and, more recently, the BA-American Airlines (AA) link-up.

Tactical alliances, on the other hand, are very narrow and focus on only one field of co-operation, for example, code-sharing on one route (for example, between Air Mauritius and Austrian Airlines on the Vienna-Mauritius route, and between Luxair and CSA on the Prague-Luxembourg route). These alliances are mainly designed to reap benefits in the short term though they could act as stepping stones to wider-ranging alliances. From the surveys conducted by The Airline Business, one can observe that the number of tactical alliances in existence far outweighs that of strategic ones. This can be attributed to the rapid payoffs which can be gained from them and the relative ease with which they can be managed.

Even less important than tactical partnerships are alliances involving only a passive equity involvement. BA and Air France have a number of such alliances with a number of African airlines. The reasons for those alliances are mainly political in nature and stem from the colonial ties which the UK and France have with those African countries.

4.2.2 Market-oriented v/s cost-oriented alliances

Airline alliances can also be classified as either market-oriented or cost-oriented. Market-oriented alliances are geared mainly towards improving the product being offered to consumers in order to increase traffic flows, load factors and market share. Such alliances involve mainly code-sharing and other marketing practices such as consumers in order to increase traffic flows, load factors and market share. Such alliances involve mainly code-sharing and other marketing practices such as schedule co-ordination, block-spacing and FFP combination. Cost-oriented alliances, on the other hand, are designed to reduce costs via joint services, reciprocal sales, maintenance joint ventures, and sharing of assets. The two types of alliances in Europe, the US and Asia/Pacific are distinguished in Figure 4.6, Figure 4.7 and Figure 4.8 respectively.

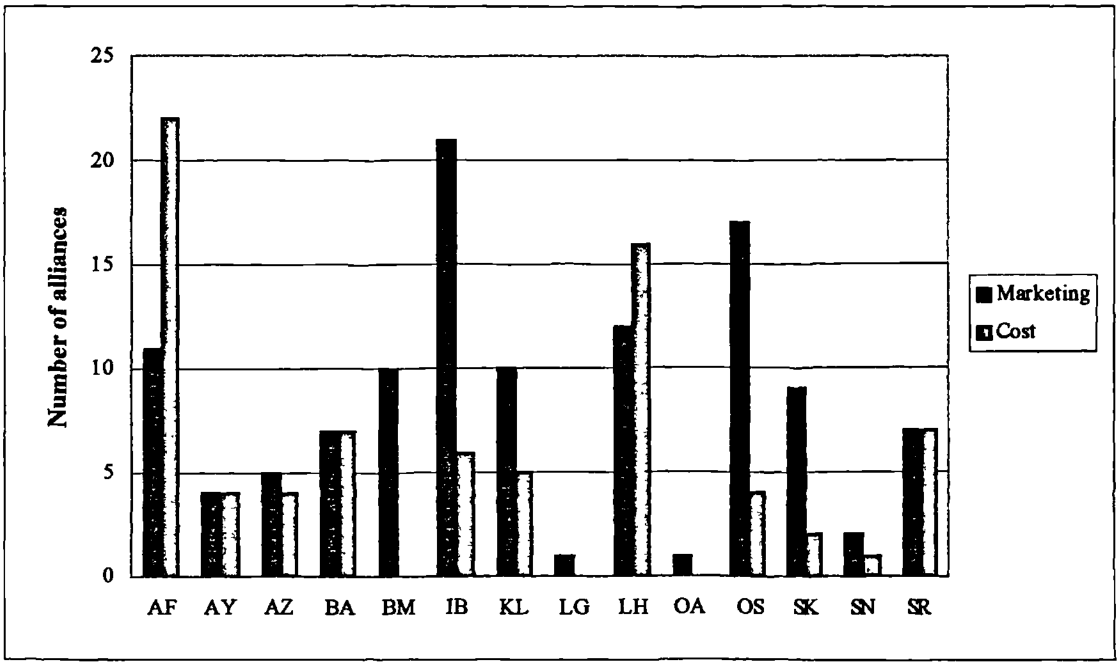


Figure 4.6 Breakdown of alliances of European airlines by type (1995)
Data source: Airline Business, June 1995
Note: airline codes are identified in the *Notation* section

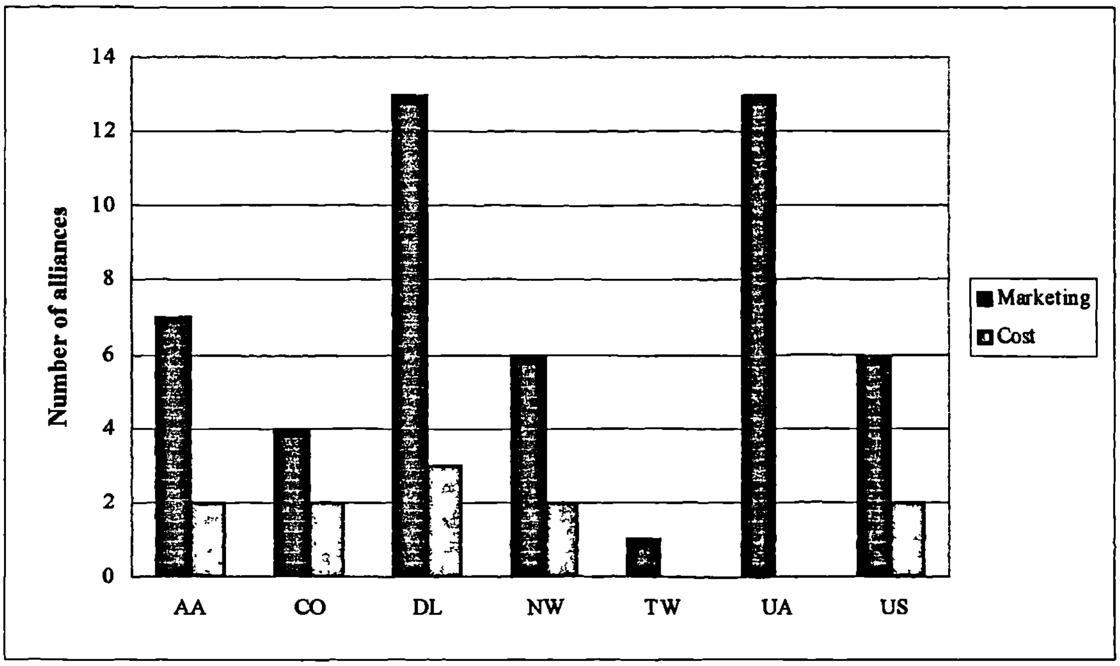


Figure 4.7 Breakdown of alliances of US airlines by type (1995)
Data source: Airline Business, June 1995
See note for Figure 4.6

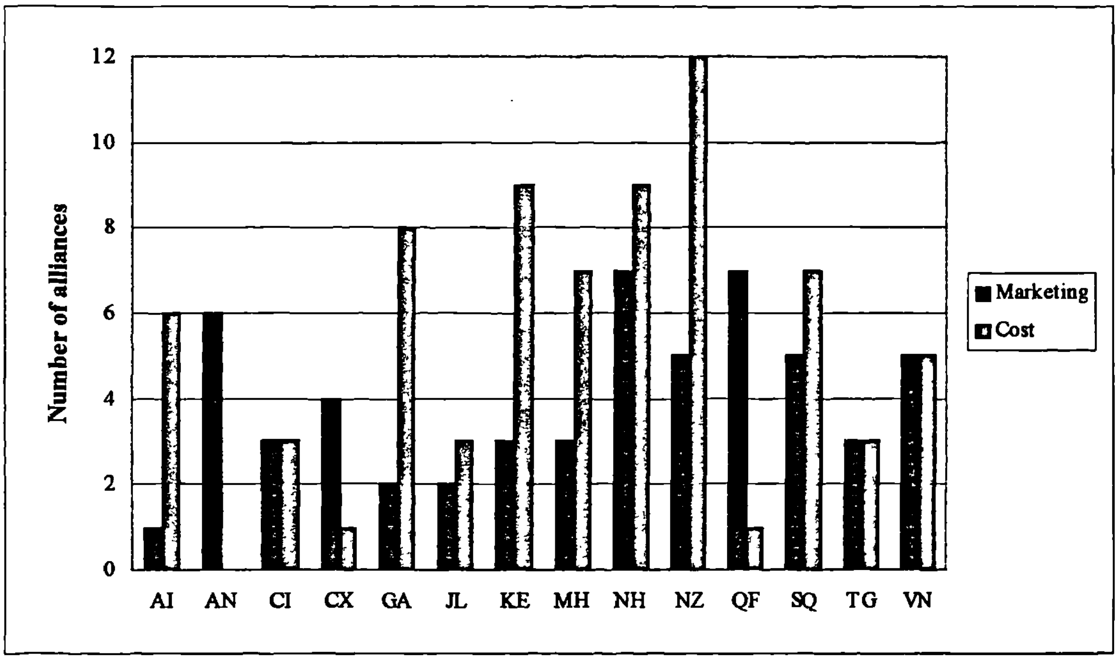


Figure 4.8 Breakdown of alliances of Asian/Pacific airlines by type (1995)
Data source: Airline Business, June 1995
See note for Figure 4.6

From the figures, one can conclude that most of the European airlines (with the exception of Air France and Lufthansa) use alliances mainly as marketing tools aimed at increasing the amount of passenger traffic on their networks. The total number of marketing alliances for the sample of airlines is 117, which is one and a half times that of cost-oriented alliances (78). Air France is particularly geared to using cost-reducing alliances which is consistent with its current precarious financial situation. The preference for marketing alliances also holds for US airlines where the number of marketing alliances is 54 and the number of cost-reducing alliances is only 12 in total. However, where Asia/Pacific airlines are concerned, the number of cost-oriented alliances (74) exceeds that of marketing alliances (56), though not by many. A possible explanation could be that European and US airlines are more interested in accessing new markets considering the near-saturation of markets in those regions. This is not the case of Asia which is forecast to have the highest growth rate in the future. Therefore, Asian airlines prefer concentrating on cost-reducing strategies.

4.2.3 Equity v/s non-equity alliances

One particular characteristic of contemporary airline alliances is the increasing prevalence of equity stakes. This is apparent in Figure 4.9 which shows the change in the number of equity alliances from 1994 to 1996.

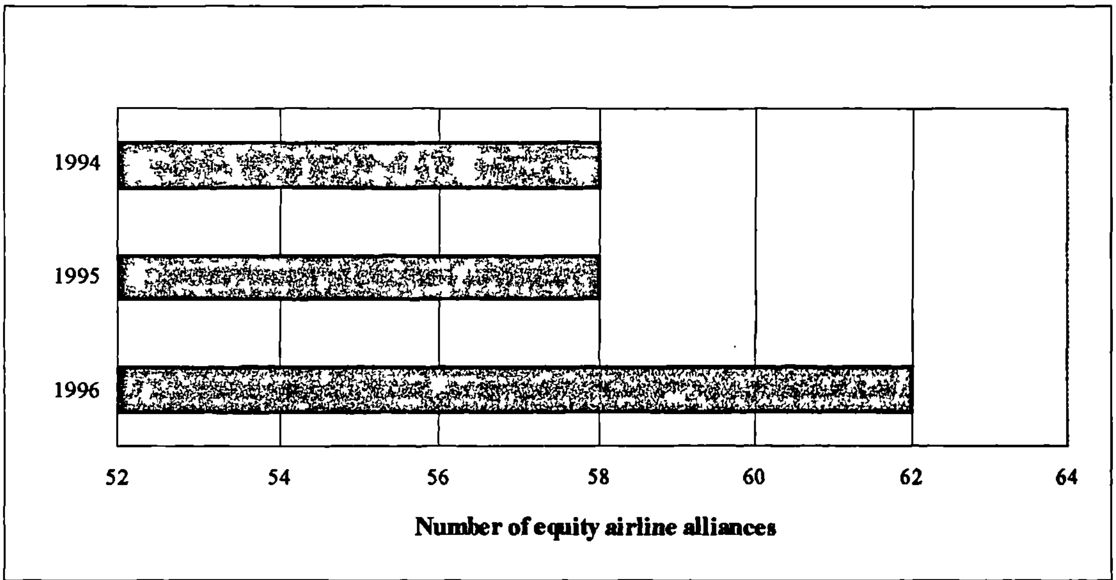


Figure 4.9 Change in the number of airline equity alliances
Source: Airline Business, June 1996

Table 4.2 gives the main equity stakes of selected European airlines as of 1996.

European airline	Airline bought into	% stake	Date acquired
Austrian Airlines	Tyrolean Airways	42.9	n/a[1]
BA	Brymon	100	August 1993
	DeutscheBA	49.0	March 1993
	GB Airways	49.0	February 1995
	Qantas	25.0	March 1993
	TAT European	49.9	September 1992
	USAir	24.6	January 1993
Iberia	A. Argentinas[2]	5.0	1990
	Aviaco	32.9	1948
	Ladeco	25.0	April 1991
	Royal Air Maroc	20.0	n/a
	Viasa	45.0	August 1991
	Viva	99.5	1990
KLM	Air UK[3]	45.0	1987
	ALM Antillean	40.0	n/a
	Martinair Holland[4]	50.0	1964
	Kenya Airways	26.0	December 1995
	Northwest Airlines	19.9	1989
	Transavia	80	1992
Lufthansa	Lauda Air[5]	39.7	January 1993
	Luxair	13.0	December 1992
SAS	British Midland	40.0	December 1988
	Spanair	49.0	n/a
Swissair	Austrian Airlines	10.0	May 1989
	Crossair	67.0	n/a
	Delta Airlines	4.6	September 1989
	Sabena	49.0	July 1995
	SIA	0.6	August 1991

Table 4.2 Major equity stakes of selected European airlines (1996)
Source: Airline Business, July 1996
Notes:
[1]not available
[2]Iberia was forced to transfer most of its 83% stake to a holding company controlled by its government parent Teneo to satisfy EU conditions for state aid approval
[3]Raised from 14.9% in March 1995
[4]Raised from 29.8% this year
[5]Raised from 26.5% in 1994

The advantages of equity in airline alliances are currently unclear. Proponents of equity purchases-namely BA-argue that such financial transactions are essential to cement the relationship. Commitment to the alliance's success is enhanced and, where the equity stake is substantial, a certain degree of control over the partners is possible.

Commitment to the alliance's success is enhanced and, where the equity stake is substantial, a certain degree of control over the partners is possible. Commitment to partner survival is exemplified by the following comment from a KLM official about its alliance with Northwest: '....if we did not have the equity, we would've let [Northwest] go into bankruptcy' (Jennings. 1996b; p. 24). The belief also runs through the airline community that non-equity equity alliances tend to be short-lived (Debbage, 1994; Burton and Hanlon, 1995). Evidence from the BCG tends to support this belief (see Figure 4.10).

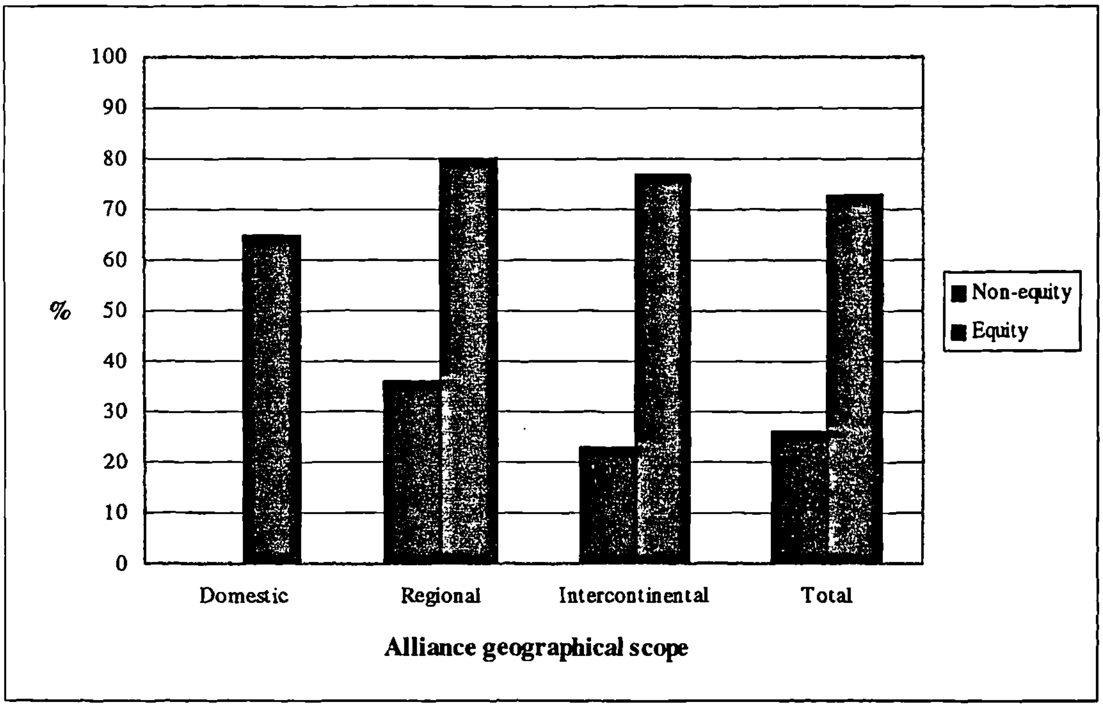


Figure 4.10 Percentage of alliances formed in 1991/1992 still in existence in 1995
Source: Lindquist (1996)

On the other hand, opponents to the involvement of equity purchases argue that they are signs of unhealthy agreements and are a symptom of airlines in distress. They consider equity investments as wasted management time and inappropriate use of investors' money (Jennings, 1990). The very equity stake which held the KLM-Northwest alliance together does seem to be responsible for driving them apart now.

Indeed, the fact that Northwest tried to limit the equity which KLM could take in it has undermined trust in the relationship and is the reason why the alliance is slowly breaking.

So much that Al Checchi and Gary Wilson, respectively Chairman and CEO of Northwest airlines, believe that '...the notion of equity in an alliance is at least a hindrance and at most a distinct liability' (Jennings, 1996a; p. 24).

Regardless of those diverging opinions, it does seem that equity is being increasingly considered as a main ingredient of airline alliances. This may be a precursor to single entity multinational airlines as predicted by Gialloretto (1988) and Freud (1995) (see Figure 4.11).

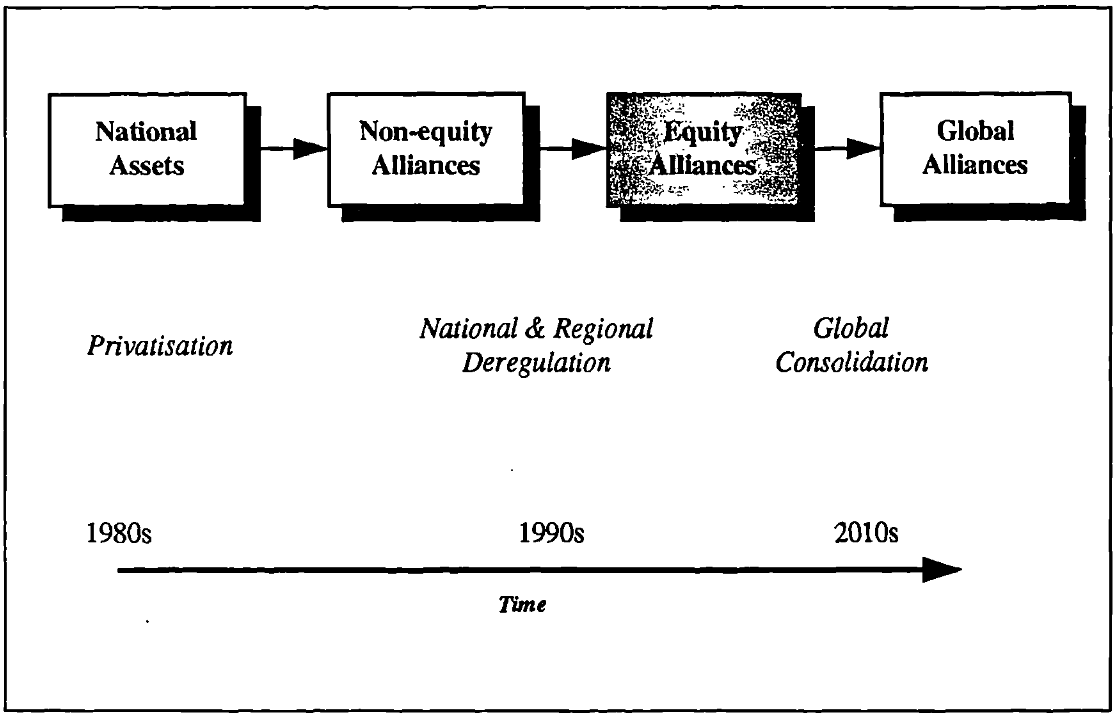


Figure 4.11 Steps in the formation of global mega-carriers
Adapted from Gialloretto (1988) and Freud (1995)

4.3 Major Airline Groupings, Past And Present

Since the beginning of the decade, airlines were in some kind of a 'trial' phase in which partners were selected, allied to and then rejected when the alliance did not yield the expected benefits. Recently, the situation seems to have become slightly more stable as airlines have found and settled down with what they consider to be suitable partners. Five major airline groupings have emerged from the alliance shakeout. They are identified in Table 4.3.

Airline grouping	Main constituent airlines	Airline base
EQA and Global Excellence	Swissair	Switzerland
	Austrian Airlines	Austria
	Sabena	Belgium
	Delta Airlines	US
	SIA	Singapore
The Lufthansa grouping	SAS	Scandinavia
	Thai Airways Int'l	Thailand
	United Airlines	US
	Varig	Brazil
	SAA	South Africa
The KLM grouping	Air UK	UK
	Northwest Airlines	US
	Transavia	Netherlands
The BA grouping	DeutscheBA	Germany
	TAT European	France
	Qantas	Australia
	USAir	US
	American Airlines[1]	US
The Iberia grouping	A. Argentinas	Argentina
	Viasa	Venezuela
	Ladeco	Chile

Table 4.3 Main airline groupings
Note: [1]The alliance will take effect as from April 1, 1997.

In the next section, the development of these alliances as well as their global scope and strategic rationale is analysed.

4.3.1 The EQA and the Global Excellence

The EQA was one of the first strategic airline alliances to be created. It came to existence in October 1989 and consisted of Swissair, SAS and Finnair at that time. Austrian Airlines joined the group later in the year. The structure of the EQA was again modified in 1991 with the withdrawal of Finnair. The remaining airlines bought small equity stakes from one another to cement the alliance together. From 1991 to 1994, the EQA structure remained unchanged. Though the alliance seemed to be yielding benefits, SAS suddenly left the EQA in 1994 to step up its co-operation with Lufthansa. SAS explained its withdrawal by its desire to ally with a large carrier rather than with mid-sized carriers. In addition, the EQA was not moving fast enough to its liking. To fill the gap left by SAS, Swissair bought a substantial stake (49.5%) in Sabena in 1995.

The basic goal of the EQA was to solidify the positions of its constituent airlines in Europe by allowing each one to achieve critical mass, without however involving their merger. The alliance between the mid-sized carriers was deemed essential for their survival after European liberalisation as domination by the European majors was foreseen. Initially, co-operation prevailed in the technical, commercial and route planning sectors. The alliance then evolved to marketing aspects to allow the carriers access to one another's markets via more efficient hub connections.

The EQA, as it stands today, is built around the partner airlines' respective hubs: Geneva, Zurich, Vienna and Brussels. This multi-hub strategy offers the potential for a large number of connections, thus expanding the individual networks of the airlines. Sabena allows Swissair to gain a foothold in the European Union (EU) while Swissair provides Sabena and Austrian Airlines access to the Middle East and Indian sub-continent. Swissair also provides Sabena with much-needed capital. Austrian Airlines broadens the partners' access to the Middle East and is the bridge towards Eastern Europe. Details of the co-operation between the EQA members are given in Table 4.4.

Partner airlines		Co-operation details
Swissair	Austrian Airlines	Code-sharing from Vienna to Zurich and Geneva, and from Zurich to Linz, Salzburg, Graz, Klagenfurt and Innsbruck. Shuttle services on Zurich-Vienna. Catering, handling and maintenance joint ventures. FFP co-operation.
Swissair	Sabena	Code-sharing on Brussels-Geneva and Brussels-Zurich. Co-operation on sales and reservations, ground services, information systems, freight and FFPs.
Austrian Airlines	Sabena	Block-space agreement and code-sharing on Vienna-Brussels. FFP co-operation.

Table 4.4 Collaboration details of EQA members
Source: Airline Business, June 1996

The Global Excellence was also formed in 1989. The alliance initially bound the airlines together by equity stakes of around 5%. The Global Excellence gives the constituent airlines a hub-and-spoke pattern in the intercontinental arena with a presence in three important regions, namely Europe, the US and Asia/Pacific.

Previously, agreements were on a bilateral basis between Swissair and the two other airlines. This has changed with recent collaboration between Delta Airlines and Singapore Airlines (SIA). Integration of the EQA and Global Excellence is also progressing with co-operation occurring between Austrian Airlines and Delta Airlines, and with SIA. Recently, the EQA and Global Excellence have received antitrust immunity from the US authorities, which grants them greater freedom in their collaboration. Details of collaboration within the Global Excellence and between the Global Excellence and the EQA are given in Table 4.5.

Partner airlines		Co-operation details
Swissair	Delta Airlines	Code-sharing from Zurich to New York JFK, Atlanta and Cincinnati, on Geneva-New York JFK and on intra-European routes to Stuttgart, Frankfurt and Munich via Zurich. Schedule co-ordination, FFP co-operation and joint handling. Trilateral code-share agreement with Austrian Airlines on Vienna-Geneva-Washington. Joint purchasing with SIA.
Swissair	SIA	Co-ordination of schedules, code-sharing, joint handling and FFP link.
Delta	SIA	Code-sharing and block-spacing on SIA's Singapore-New York JFK service via Europe. Joint purchasing with Swissair.
Delta	Austrian Airlines	Code-sharing on Vienna-New York, Vienna-Atlanta and on intra-European flights from Vienna to Hamburg, Kiev and Odessa. Trilateral code-share agreement with Swissair on Vienna-Geneva-Washington.
Delta	Sabena	Block-spacing and code-sharing from Brussels to Atlanta, New York, Chicago and Boston, and on flights to Germany via Brussels.

Table 4.5 Collaboration details of Global Excellence and EQA members
Source: Airline Business, June 1996

The combined route network of the EQA and Global Excellence cover the US, Europe and Asia/Pacific, with a presence in Africa via Swissair and Sabena (see Figure 4.12).

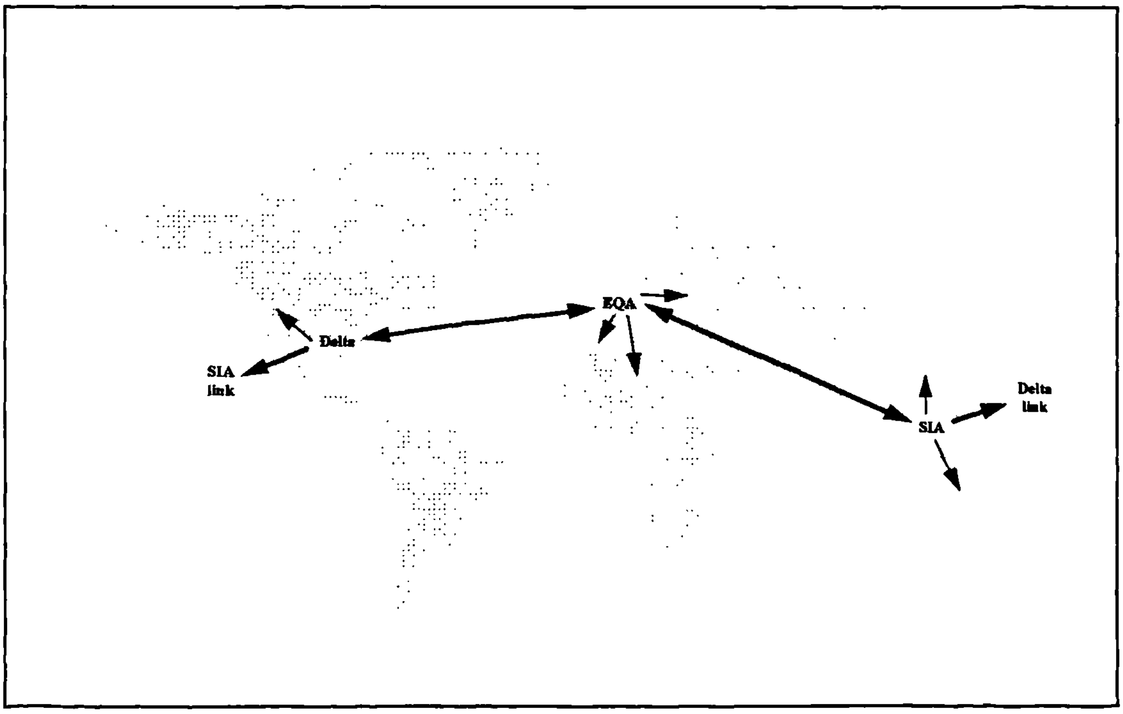


Figure 4.12 EQA and Global Excellence world-wide coverage

4.3.1.1 The Alcazar project

At this point, it is worth to briefly look at the notorious Alcazar alliance which failed in 1993. The Alcazar project which came to life in April 1993 intended to add KLM to the EQA to create '....a fourth airline force, able to mix it successfully with [Europe's] three giants-Air France, BA and Lufthansa-to compete with the US and Asian carriers and......withstand the cold blast of Common Market aviation liberalisation' (Reed, 1994a; p. 33). Indeed, Alcazar would have been Europe's second largest airline immediately after BA, with consolidated annual sales of about $15 billion and passenger traffic of 32 million yearly (Sparaco, 1993). Its traffic system would have been based on a multi-hub network around Amsterdam, Copenhagen, Geneva, Oslo, Stockholm, Vienna and Zurich, hence enabling it to offer customers services to 200 on-line destinations.

The project collapsed for one main reason which was divergence on the choice on US partner. KLM stood by Northwest Airlines since that alliance was advantaged by antitrust immunity. Swissair, on the other hand, was unwilling to give up Delta

Airlines for it was in better financial shape than Northwest Airlines and also because it had a much more extensive network into Europe (Reed, 1994a). Furthermore, Singapore Airlines, Swissair's partner in the Global Excellence alliance, could have terminated its alliance with Swissair had Northwest Airlines been adopted as Alcazar's US partner.

4.3.2 British Airways' global alliances

4.3.2.1 British Airways-USAir

Since 1992, one of BA's objectives has been 'To secure a leading share of air travel business world-wide with a significant presence in all major geographical markets' (BA Financial Report, 1992). The first step towards achieving this goal was the alliance with USAir which was first announced in July 1992. Under the original agreement, BA would take a $750 million stake in USAir in convertible bonds. These would give BA 44% of USAir's current common equity including 21% of the voting stock. BA would also gain four seats on USAir's board of directors. Following objections by American, United and Delta, the deal was not approved. In January 1993, BA came back with another deal which would give it a 19.9% stake in USAir for $300 million. The deal was approved and since then, the stake of BA has increased to 24.6%.

The alliance with USAir offers BA access to the US domestic market. The transatlantic flights of the European carrier connect with USAir domestic services at seven points, Los Angeles, Charlotte, Washington-Dulles, Baltimore, Philadelphia, New York-JFK and Boston. BA then code-shares with USAir on 64 intra-US routes from these points. BA's transatlantic flights also benefit greatly from traffic feed since USAir's network is concentrated primarily on the US East coast from which two-thirds of US transatlantic passengers originate their trips (McKenna, 1992). In spite of the soundness of the strategy, the alliance has run into trouble because of the worsening financial difficulties of USAir[18]. This has lead BA to suspend further investment in USAir until its financial results improve and concrete cost-cutting measures are implemented. Recently, USAir has issued a lawsuit against BA concerning its proposed alliance with American Airlines. According to USAir, that alliance is anti-competitive and is a breach to the exclusivity contract which BA signed with it.

4.3.2.2 British Airways-TAT and British Airways-DeutscheBA

The alliance between BA and TAT was sealed in the fall of 1992 when BA acquired a 49.9% stake in TAT for $15 million (Wood, 1994). BA has the option to acquire the company wholly in 1997. The objective of BA in allying with TAT is to provide competition with Air France in its domestic market and to expand into continental Europe after liberalisation. TAT views the alliance with BA as a means of speeding up its efforts to grow from a regional carrier providing domestic service to an international one.

Negotiations between BA and DeutscheBA[19] (DBA) were initiated in February 1992 and the agreement was reached in March of the same year. The amount of the investment has not been revealed though it is estimated to range from $5 million to $10 million for a 49% stake. DBA is the successor of BA's Internal German Services (IGS) which was set up in 1946 and reserved German routes for the victorious powers of World War II. Following German reunification, the IGS was gradually eliminated and DBA enables BA to maintain its presence in Germany and compete effectively with Lufthansa.

Both TAT and DBA constitute important pieces in BA's strategy of creating low-cost pan-European carriers capable of building up its dominant position in 1997 when full cabotage rights will be extended to EU airlines. Though co-operation is only with BA for the time being, there are plans for TAT and DBA to collaborate in the future.

[18] Financial losses were estimated at $685 million in 1994 (Nuutinen, 1995) and a total of $2.4 billion from 1989 to 1994 (Jennings, 1994).
[19] Previously Delta Air Regionalflugverkehr GmbH.

4.3.2.3 British Airways-Qantas

The alliance between BA and Qantas was sealed in March 1993 when BA purchased 25% of Qantas for A$665 million. At that time, Qantas was in the process of privatisation and BA beat SIA in the bid for the stake. The alliance offers BA access to the Asian/Pacific region which is forecast to have the highest growth rate. The networks of the two airlines join at a number of points: Frankfurt, Paris and Rome in Europe, Harare and Johannesburg in Africa, Vancouver, San Francisco, Los Angeles and Buenos Aires in the Americas, and Kuala Lumpur, Jakarta, Singapore, Bangkok, Hong Kong, Manila, Seoul, Fukukoa, Nagoya and Tokyo in Asia. In June 1995, the two airlines were allowed to co-ordinate schedules and pricing on the Australia-Europe route by the Australian Trade Practices Commission.

4.3.2.4 British Airways-American Airlines

The alliance between BA and AA was signed in June 1996 and intends to become effective as of April 1997. This followed months of speculation as to whether BA would ally with KLM or AA. The agreement is conditional on the US Government granting antitrust immunity to the alliance, allowing them to co-ordinate their operations and to market closely. However, the US has agreed to grant immunity to the alliance conditional to an 'Open Skies' agreement with the UK, allowing US airlines to fly freely to any point in the UK including London Heathrow. The alliance has the potential to offer joint fares on 36, 000 routes between their networks; code-sharing can allow them to offer travellers a global system (Walters, 1996). Together with USAir, AA can offer BA access to a major part of the US domestic market.

The details of co-operation in the alliances of BA are given in Table 4.6.

Partner airlines		Co-operation details
BA	DeutscheBA	Joint FFP. World-wide marketing and sales representation. Co-operation on engineering, purchasing and information technology.
	TAT European Airlines	Joint FFP. World-wide marketing and sales representation. Co-operation on engineering, purchasing and information technology.
	Qantas	Joint FFP and use of airport lounges and sales offices. Round the world fare with USAir. Reciprocal ground handling and catering. Global freight co-operation. Joint purchasing. Code-sharing between Auckland and Los Angeles on Qantas Aircraft. Close co-operation on UK-Australia services.
	USAir	Joint FFP. Wet leasing from London/Gatwick to Pittsburgh, Charlotte and Baltimore. Code-sharing to 64 US destinations. Round the world fare with Qantas. Plans for joint marketing, purchasing and information technology. Engineering co-operation.
	American Airlines[1]	Proposals for code-sharing and joint scheduling. Joint FFP.

Table 4.6 Collaboration details of BA' alliances
Source: Airline Business, June 1996
Notes:
Franchise agreements are excluded
[1]The alliance is not yet operational

The alliances of BA have enabled the airline to become a truly-global carrier. Indeed, BA has a presence in all major markets (except Asia) as one can see in Figure 4.13.

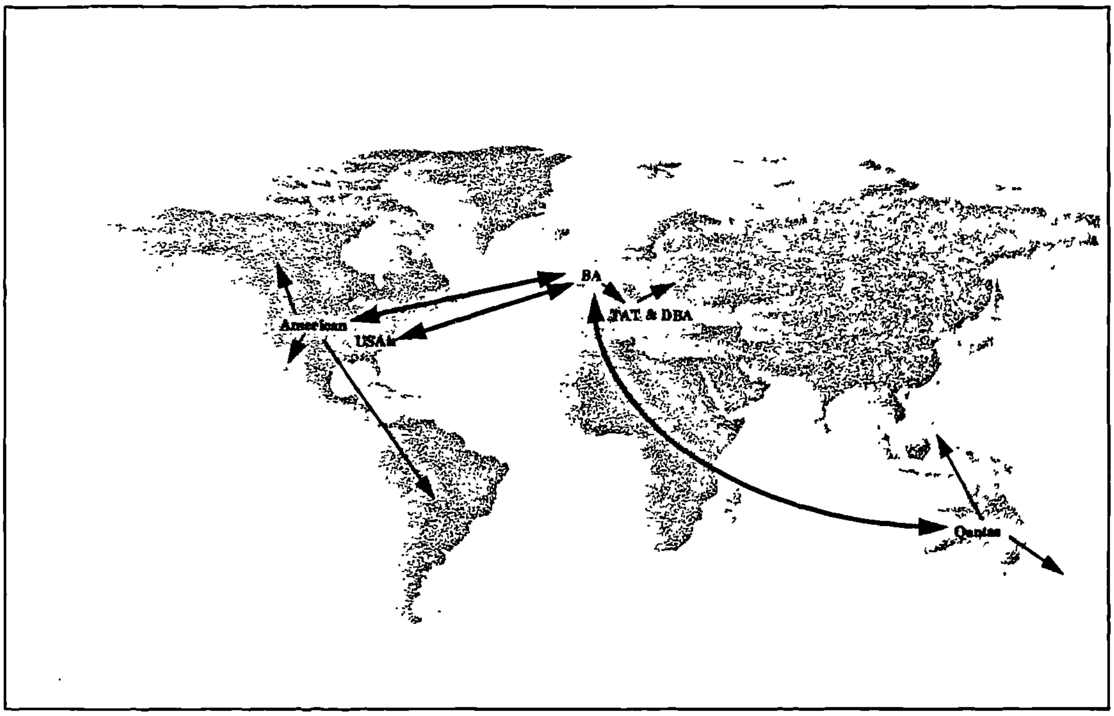


Figure 4.13 BA' global alliances

Apart from these major alliances, BA has a number of other minor tactical alliances which are not listed here. In addition, BA has been pushing its franchising strategy in the UK and Europe. BA's franchising agreements are considered in Chapter 6.

4.3.3 Latin-American alliances of Iberia

Iberia's alliances with the Latin-American carriers, Aerolineas Argentinas, Viasa and Ladeco were formed in the period 1990-1991 with Iberia purchasing equity stakes in them. The need for alliances stemmed from the fact that Iberia is a mid-sized European carrier which needed to find a competitive edge to survive in a deregulated environment increasingly dominated by global alliances. Aerolineas Argentinas, Viasa and Ladeco were a logical choice for investment by Iberia because of the strong cultural, ethnic and linguistic ties between Spain and Argentina, Venezuela and Chile. The focus of Iberia's strategy was to provide an efficient link between Latin America and Europe and beyond via its hubs in Madrid and Miami (see Figure 4.14). Madrid is in an advantageous geographical position on Europe's south-western flank and is a popular stop-over point for Latin-American visitors to Europe. Hence, it is the only European city which can support daily service to several Latin American destinations. The Miami hub could be used to capture a substantial portion of the North-South traffic between Latin America and the US (Debbage, 1994). Having an extensive coverage of the Latin American region would also make Iberia an attractive alliance partner for European majors.

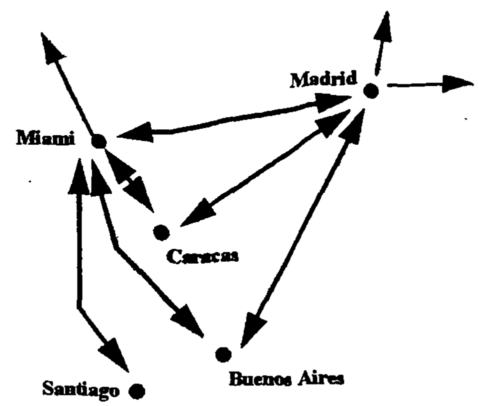


Figure 4.14 Iberia's Latin-American alliances

The essence of the collaboration between Iberia and its Latin-American partners is given in Table 4.7.

Partner airlines		Co-operation details
Iberia	A. Argentinas	Management contract. Code-sharing, joint route operation and joint FFP.
	Viasa	Management contract. Code-sharing, joint route operation, freight co-operation, joint FFP and schedule co-ordination.
	Ladeco	Code-sharing, joint route operation and joint FFP.

Table 4.7 Collaboration details of Iberia's alliances
Source: Airline Business, June 1996

In spite of the sound logic behind them, the alliances of Iberia are not successful. This is mainly because both it and its partners have continued to lose enormous amounts of money. In 1992, Aerolineas Argentinas lost $190.4 million, Viasa lost $52 million

(Whitaker, 1993), while Ladeco lost $21 million from 1990 to 1992 and $2.6 million in the first half of 1993 (Jennings, 1993). All three have required equity infusions, loans and guarantees which have lead to an increase in Iberia's financial exposure. Iberia itself has been bleeding money heavily since the Gulf War: $824 million between 1990 and 1992 (Whitaker, 1993). It has also benefited from state aid on the condition that its stake in Aerolineas Argentinas be substantially reduced. Its ability to continue its alliance strategy in Latin America is therefore very much in question.

4.3.4 KLM-Northwest Airlines

The KLM-Northwest alliance was created in 1989 when $400 million were invested for 20% of Northwest's common stock and 10.5% of the voting stock in Wings Holdings, the owner of Northwest Airlines. The objective of KLM was to access new markets and benefit from traffic feed originating from the US. The KLM-Northwest alliance was unique at that time in that it was the first alliance to be granted antitrust immunity. The alliance is hailed by many analysts as a model of a successful one as it has helped both airlines to effectively cut costs and increase profits. Northwest has been able to turn its net loss of $115.3 million in 1993 to a profit of $295.5m in 1994, thanks to its alliance with KLM (McGrath, 1995). The alliance between KLM and Northwest involves code-sharing and comprehensive marketing agreements on the North Atlantic, in the domestic US and in Europe. Certain flights are jointly operated, FFPs are linked and the airlines practice joint ground handling, sales, catering, maintenance and purchasing.

However, the alliance has recently run into problems when Northwest Airlines was recently mentioned as a potential target for merger with USAir. Northwest adopted a scheme to prevent KLM from raising its stake in the US carrier from 18.8% of the voting rights to 25% claiming that KLM posed a 'creeping control threat'[20] to it. KLM eventually issued a lawsuit against Northwest major shareholders for breach of contract. This succession of events has damaged the relationship between KLM and

[20] Flight International, 10-16 January 1996, p. 13.

Northwest. However, both airlines maintain that the alliance is still working at the operational level.

4.3.5 The alliances of Lufthansa

Similarly to BA, Lufthansa has recently been forging alliances in order to have a significant global presence (see Figure 4.15). However, unlike BA, the alliances of the German airline do not involve equity purchases. The alliances with Varig and United were the first ones to be formed back in 1993 with the goal of accessing the Americas. Before that, Lufthansa had the choice between United and American as its strategic partner. The final decision came when the US and German Governments concluded their negotiations for new liberal bilaterals between the two countries. These partnerships were followed by Thai Airways in 1994 to secure a presence in Asia, and by SAS and South African Airways (SAA) in 1995 to strengthen Lufthansa's presence in Europe and Africa respectively. The details of Lufthansa's partnerships are given in Table 4.8.

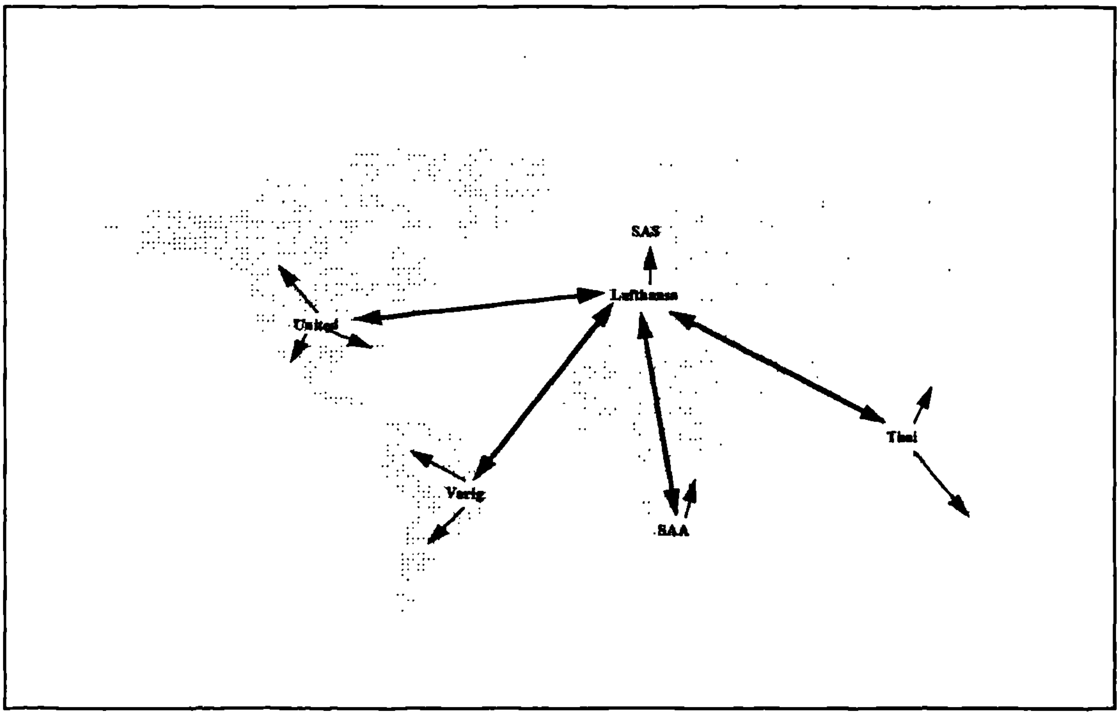


Figure 4.15 Lufthansa's global alliances

Partner airlines		Co-operation details
Lufthansa	SAS	Code-sharing between Germany and Scandinavia. Joint FFP, ground handling and through check-in. Shared passenger lounges and terminal facilities.
	Thai	Code-sharing between Thailand and Germany and beyond. Shared passenger lounges and terminal facilities. Advanced seat reservation and through check-in on code-share flights. Joint FFP and development of Bangkok as a joint cargo hub with joint cargo services through south-east Asia, Australia and New Zealand. Trilateral agreement with United Airlines.
	Varig	Code-sharing from Frankfurt to Rio de Janeiro and Sao Paulo. Joint FFPs and through check-in.
	SAA	Code-share flights on Johannesburg and Cape Town to Frankfurt, Munich and Dusseldorf. Joint FFP, ground handling and shared passenger lounges.
	United Airlines	Comprehensive marketing and multiple code-share agreements between Germany and the US.

Table 4.8 Collaboration details of Lufthansa's alliances
Source: Airline Business, June 1996

Early this year, the US and Germany signed an 'Open Skies' agreement and the Lufthansa-United alliance has recently secured antitrust protection. Apart from the airlines listed above, Lufthansa has a number of tactical alliances with other airlines throughout the world. Lufthansa is currently the second carrier having the greatest number of alliances (26) coming after the Air France Group (31) (Gallagher, 1996).

4.3.6 The alliances of SAS

SAS was one of the first airlines to recognise the importance of strategic alliances. Therefore, under the direction of Jan Carlzon, links were created with a number of airlines as far back as 1987. The airline started on a spree of investments: 24.6% of Airlines of Britain, 40% of LanChile, 49% of Spanair, 5% of Swissair, 5% of Austrian Airlines and 18.4% of Continental Airlines. Marketing alliances were also created with All Nippon Airways (ANA), Canadian Airlines and Thai Airways. The intention was to turn SAS into a global carrier which could survive in spite of its relatively small size, its disadvantaged position on the outskirts of Europe and its small domestic population (Feldman, 1991).

However, the global strategy did not work as expected and SAS has had to shed many of its partners (see Figure 4.16). That was mainly because of the financial difficulties which the partners were experiencing. Continental Airlines, for example, filed for bankruptcy protection in 1990, which lead SAS to write off its $100 million investment. The stake in LanChile was sold in 1994 for about half the value of the initial investment. Recently came the break from the EQA. Currently, the only major alliances of SAS are with Lufthansa, United, British Midland and Thai Airways.

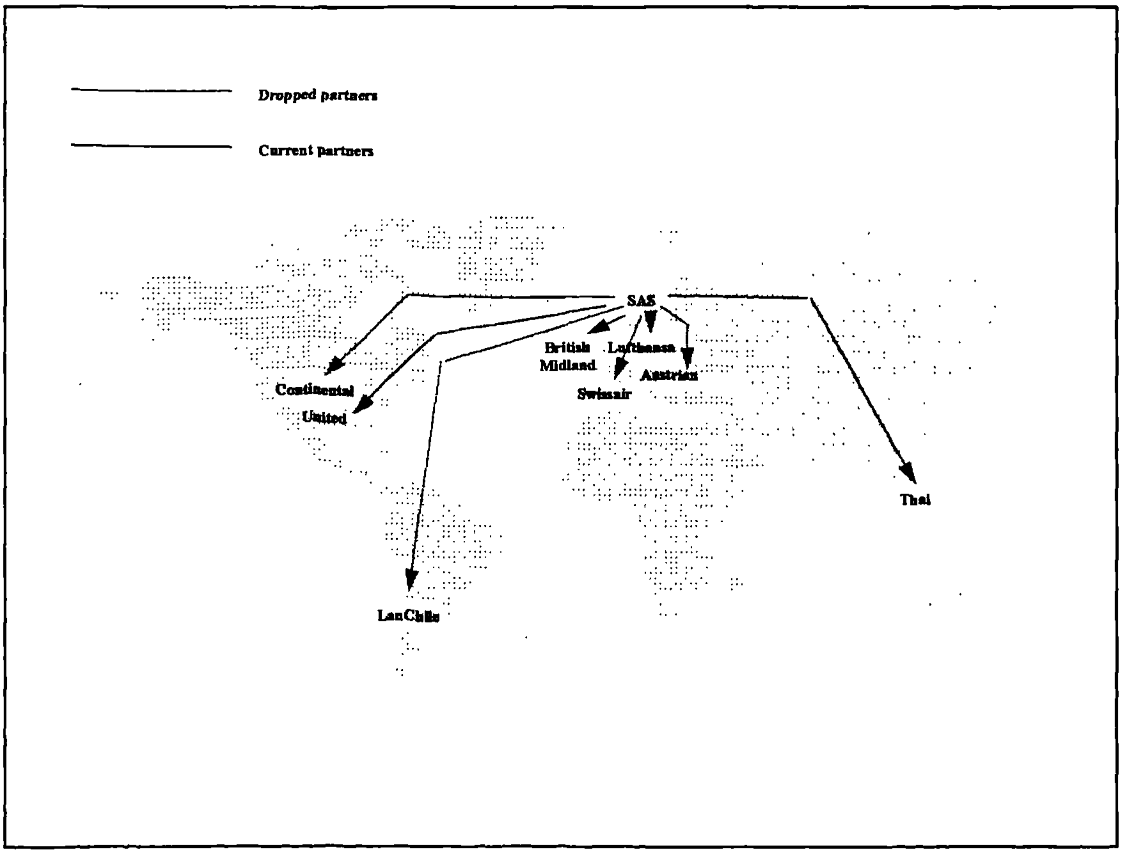


Figure 4.16 Past and present strategic alliances of SAS

4.4 Comparison of Alliances

With the formation of global groupings, it seems that the air transport industry is heading towards a situation where competition will be between global alliances rather than individual carriers. It would be interesting to investigate how current and defunct alliances compare with one another in terms of size and global coverage. In this section, the comparison of alliance size is made on the basis of number of aircraft, number of passengers carried, and total revenue passenger-kilometres (RPK). Global coverage is measured as the sum of the points in the networks of the partner airlines taking into account duplicated points.

The size of current strategic airline alliances is given in Figure 4.17, Figure 4.18 and Figure 4.19. The former EQA which incorporated SAS, the Alcazar alliance and the potential BA grouping with AA are also included for comparative purposes.

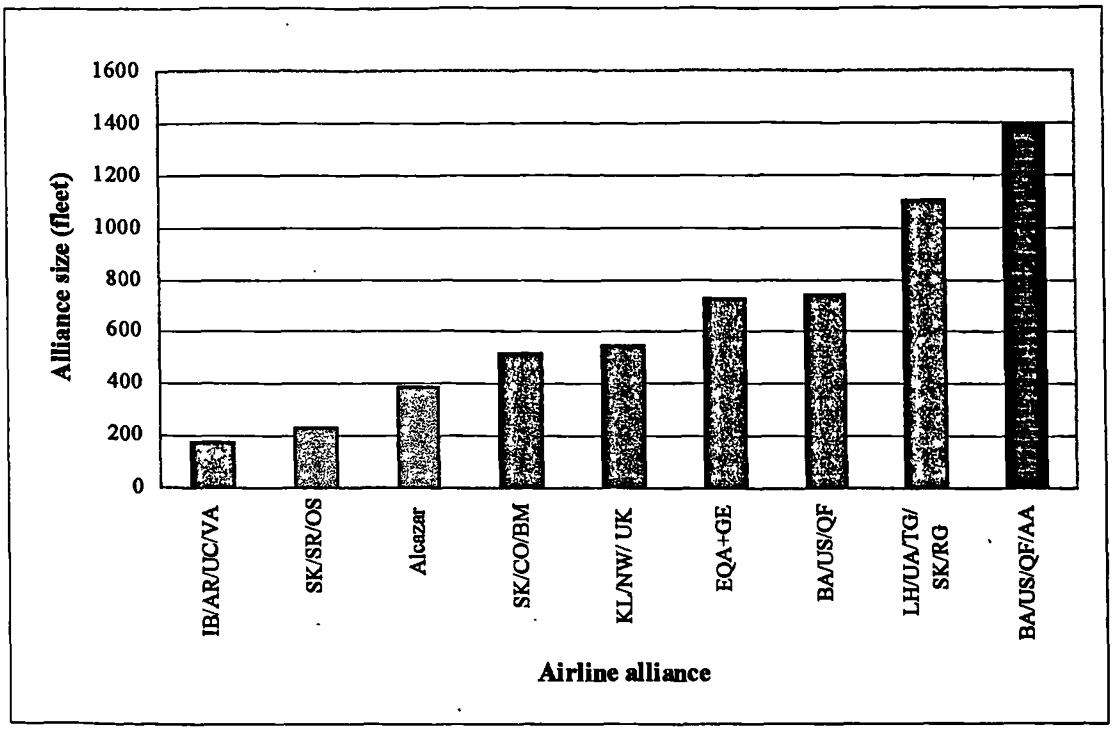


Figure 4.17 Fleet size of strategic airline alliances
Source: IATA WATS, 1995
Notes:
SK/SR/OS and Alcazar are no longer in existence
BA/US/QF/AA is still awaiting approval

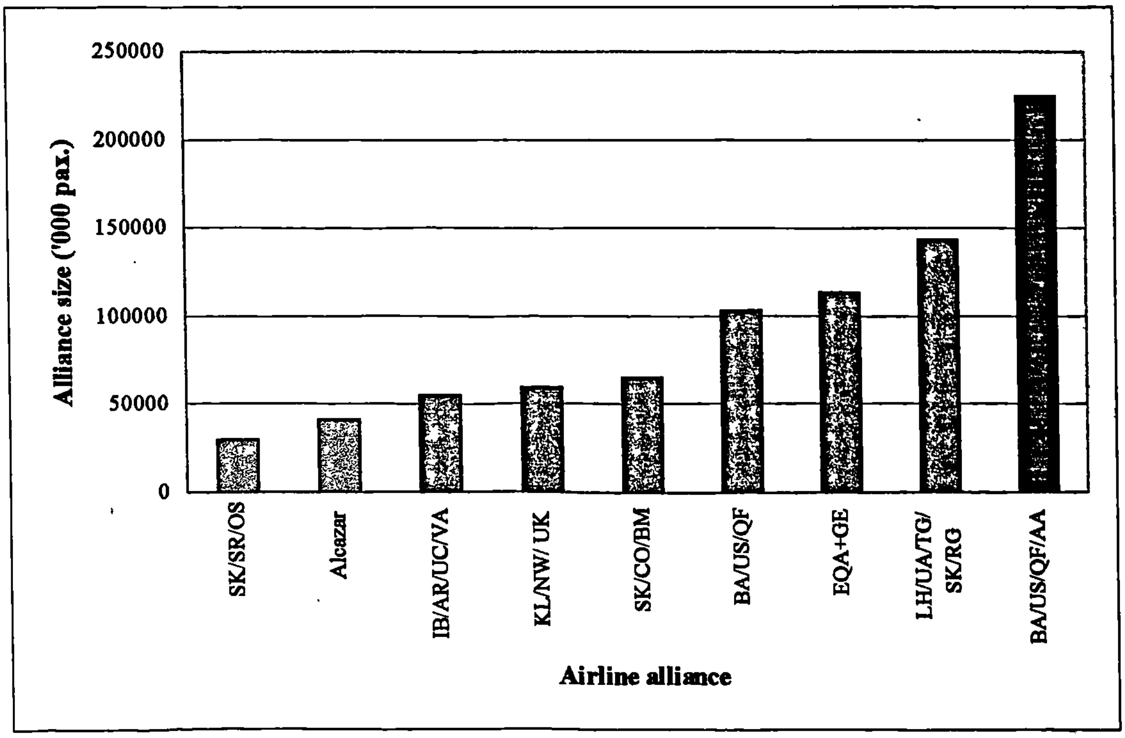


Figure 4.18 Total passengers carried by strategic alliances
Source: IATA WATS, 1995
See notes for Figure 4.17

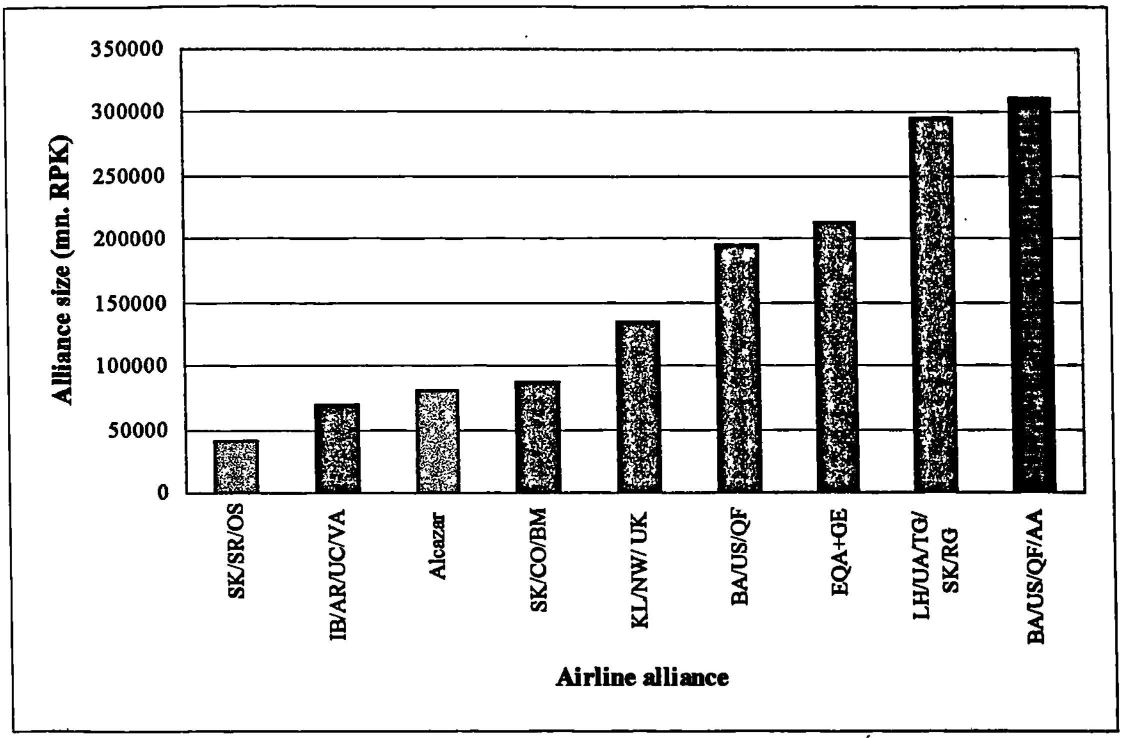


Figure 4.19 Total output of strategic airline alliances
Source: IATA WATS, 1995
See notes for Figure 4.17

From those figures, one can observe that the Lufthansa strategic grouping is the largest in terms of all three measures, followed by that of Swissair (EQA and Global Excellence) and of BA. However, were the BA-AA alliance formed, the BA grouping would then be the largest. The KLM and SAS groupings fall in the medium-sized category while the former EQA and the Iberia grouping fall in the category of small alliances. Even the inclusion of KLM in the EQA to form Alcazar would not have promoted it to a medium-sized global alliance. This could be one of the reasons why SAS has preferred to opt out of the EQA and consolidate its alliance with Lufthansa. However, Alcazar would have been a major force in Europe as it is quite sizeable when compared to EU majors (see Figure 4.20).

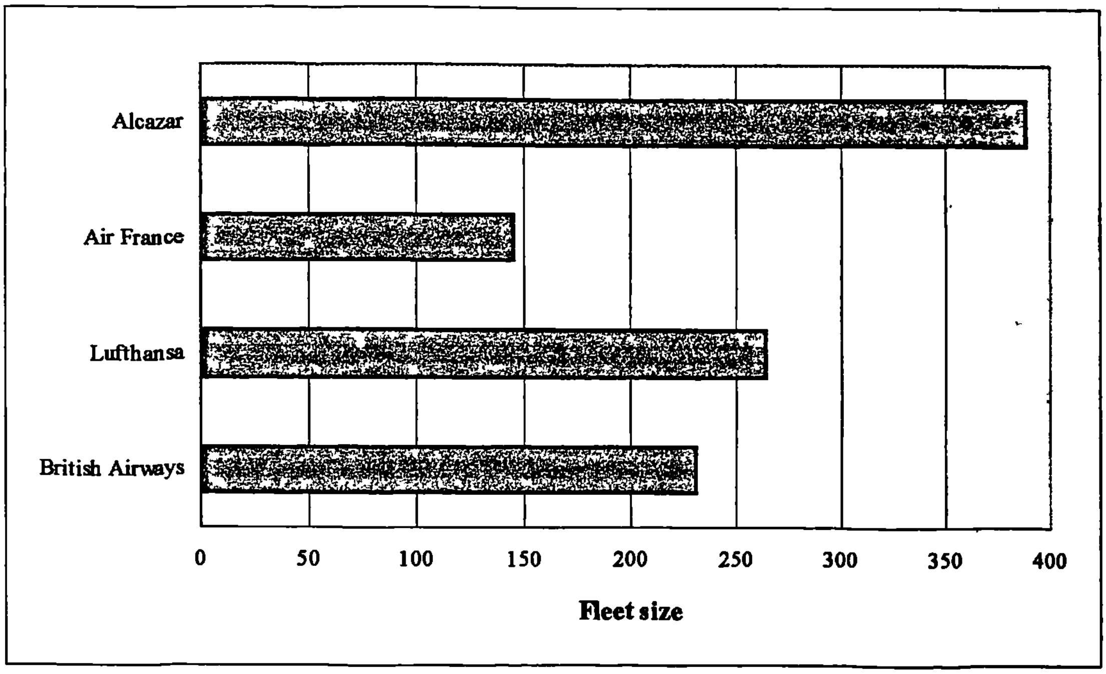


Figure 4.20 Comparison of Alcazar with European majors
Source: IATA WATS, 1995

Comparison in terms of global coverage is possible from Figure 4.21. Again, of the existing alliances, the Lufthansa grouping has the largest global network. It is followed by the EQA and Global Excellence and the BA grouping. However, addition of AA to the latter promotes it to first place, with 166 more points than the Lufthansa grouping. Alcazar would have had a coverage comparable to that of the current BA grouping. This would have been brought about by KLM since the coverage of the former EQA is quite small. The KLM and SAS groupings also have a small global coverage because the main partners cover only Europe and the US. Finally comes the Iberia grouping which has the smallest coverage of all the strategic alliances.

Is there any correlation between alliance size and scope, and alliance success? In terms of traffic flows and revenues, the large alliances (BA and Lufthansa) are said to be yielding benefits, though quantification of the benefits is notoriously lacking. The medium-sized and small alliances seem to be slow in performing with however the notable exception of KLM. Indeed, the Swissair-Austrian Airlines alliance, the Global Excellence and the SAS grouping have been in existence for seven years. However, evidence of their benefits in the air transport press is scarce.

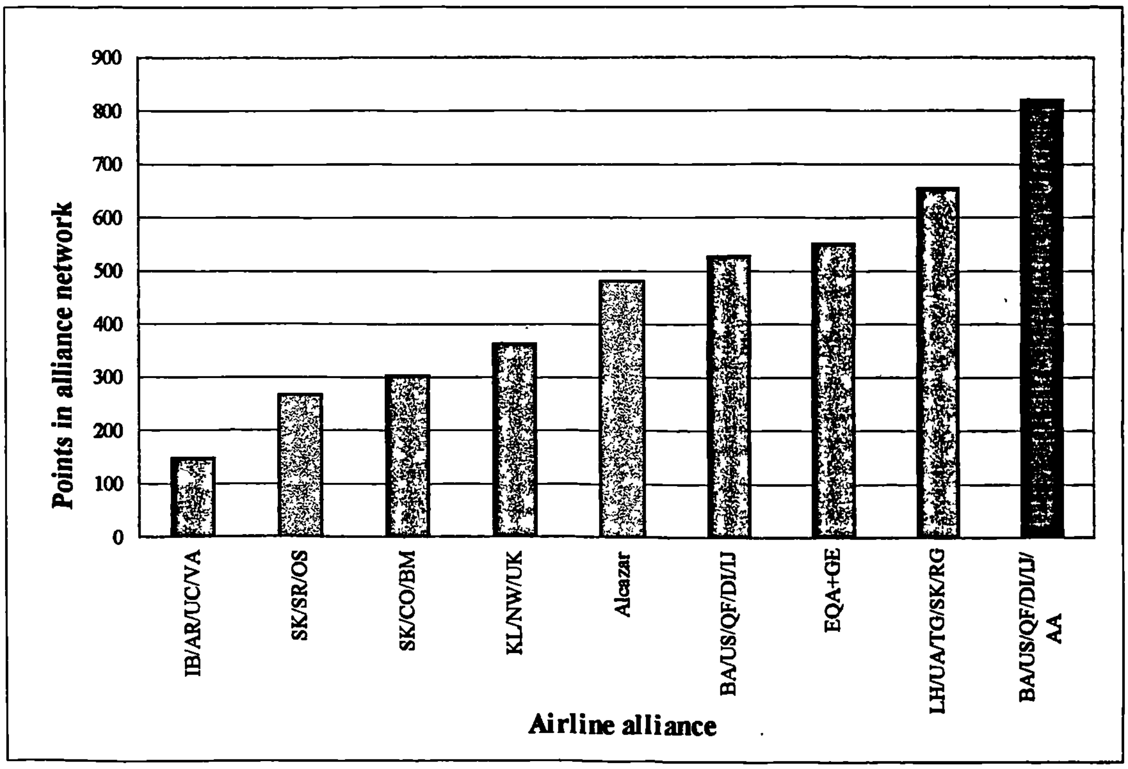


Figure 4.21 Global coverage of strategic alliances (1996)
Source: ABC Guide (1996)
See notes for Figure 4.17

Only KLM-Northwest has been widely-publicised as successful. This can be mainly attributed to the antitrust immunity which the alliance enjoys[21]. The SAS-Continental

[21] Section 4.5.2 explains how antitrust immunity can contribute to alliance success.

alliance does not benefit from such protection which could partly explain why it has not fared so well. The EQA and Global Excellence have recently obtained antitrust immunity and this could help them perform adequately and at a satisfactory rate. The Iberia grouping has been the least successful of all though this was caused mainly by the financial difficulties of the partners.

4.5 Airline Alliance Issues

Up to here, this chapter has described the evolution of airline alliances and has analysed the most prominent ones in some depth. In this section, the socio-political and economic effects of alliance formation with respect to both airlines and consumers are examined. The results of two major studies on the benefits of three strategic alliances are also presented and discussed.

4.5.1 Political issues

Most of the political wrangling with regard to airline alliances revolves around the issue of code-sharing. Basically, code-sharing is the use by one airline of its IATA designator code on flights operated by another carrier. It makes an interline service look like an online service on a CRS display[22]. Started innocently in the 1960s, code-sharing has become intricately involved in bilateral negotiations between the US and European countries and is being effectively used as an instrument of the US international aviation policy (Shenton, 1994a). This results from the fact that code-sharing has come to be considered virtually as a traffic right (de Groot, 1994) which can be used as a bargaining tool. The US-UK bilateral in which code-sharing to certain US destinations was offered to BA in exchange for access to Heathrow for United Airlines and AA is a good example of that. Another example is the liberal US-Netherlands bilateral which allows the KLM-Northwest extensive code-sharing to destinations in the US and Europe.

[22] The practice of code-sharing is detailed in Chapter 6.

In the light of the stepped-up interest of foreign carriers in securing code-sharing rights in the US, Gellman Research Associates (GRA, 1994) have proposed to make use of code-sharing to obtain access for US carriers in foreign countries. This view was echoed by the US General Accounting Office (GAO, 1995) in its study on code-sharing benefits. The GAO study also notes that foreign governments have been more prone to grant code-sharing rights to US airlines than to allow direct service by them. This, according to the GAO, makes code-sharing an even more attractive means of gaining access to international markets.

However, the use of code-sharing in that way acts in opposition to the US previously prescribed limitations on code-sharing, one of which is that the code-sharing airline must have the required traffic rights (Shenton, 1994a). De Groot (1994) points out that using code-sharing as a traffic right could be detrimental to the entire fabric of the airline industry and should therefore be controlled. He takes the example of Germany which decided to impose frequency limitations on code-sharing and also to all potential connecting services. This, he argues, is in opposition to the current interline practice in place and to the traditional frequency regimes present in bilateral agreements. Both de Groot (1994) and Goldman (1995) argue that code-sharing is a marketing instrument which should be free of regulation and government interference.

4.5.2 Competition issues

Promotion of competition is considered to be very important in the airline industry because it works towards the advantage of consumers. Therefore, alliances between airlines are usually scrutinised to identify the potential for collusion. In the EU, alliances are subject to Articles 85[23] and 86[24] of the Treaty of Rome and are granted exemptions (under Article 85(3)) to allow their operation.

[23] Article 85 of the Treaty of Rome reads as follows:
1.The following shall be prohibited as incompatible with the common market: all agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the common market, and in particular those which:

(a) directly or indirectly fix purchase or selling prices or any other trading conditions;
(b) limit or control production, markets, technical development, or investment;
(c) share markets or sources of supply;

In the US, alliances are subject to antitrust regulations[25]. Recently, the issue of antitrust immunity has gained importance and is viewed as an essential condition for alliance success as concluded from the KLM-Northwest example. Exemption from antitrust regulations enables the partners to set prices together, fix schedules, set up revenue pooling and market their product jointly; effectively, they can act as if they were a single airline. To date, the KLM-Northwest, Global Excellence and Lufthansa-United alliances are protected from antitrust regulations. BA-AA have applied for it in exchange for 'Open Skies' between the respective European countries and the US.

The potential anti-competitive effects of alliances is a source of controversy in the airline industry. Those in favour of alliances argue that they promote competition by facilitating market entry and consequently lead to higher frequencies, better scheduling and lower fares. On the other hand, those against alliances argue that they do exactly

---

(d) apply dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;
(e) make the conclusion of contracts subject to acceptance by other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.
2. Any agreements or decisions prohibited pursuant to this Article shall be automatically void.
3. The provisions of paragraph 1 may, however, be declared inapplicable in the case of:
any agreement or category of agreement between undertakings;
any decision or category of decisions by associations of undertakings;
any concerted practice or category of concerted practices;
which contributes to improving the production or distribution of goods or to promote technical or economic progress, while allowing consumers a fair share of the resulting benefit, and which does not:
(a) impose on the undertakings concerned restrictions which are not indispensable to the attainment of these objectives;
(b) afford such undertakings the possibility of eliminating competition in respect of a substantial part of the products in question (Adkins, 1994; p. 24).

[24] Article 86 of the Treaty of Rome states:
'Any abuse by one or more undertakings of a dominant position within the common market or in a substantial part of it shall be prohibited as incompatible with the common market insofar as it may affect trade between Member States. Such abuse may, in particular, consist in:
(a) directly or indirectly imposing unfair purchase or selling prices or other unfair trading conditions;
(b) limiting production, markets or technical development to the prejudice of consumers;
(c) applying dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;
(d) making the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of the contracts.
(Adkins, 1994; p. 75-76)

[25] The US antitrust laws are embodied in the Sherman and Clayton Acts passed in 1890 and 1914 respectively. Section 1 of the Sherman Act states:
Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among several states or with foreign nations, is hereby declared illegal.
Section 2 of the Act states:
Every person, who shall monopolise, or attempt to monopolise, or combine or conspire with any other person or persons, to monopolise any part of the trade or commerce among several states, or with foreign nations, shall be deemed guilty of a felony.
The Clayton Act was passed to add clarity to antitrust law, Price discrimination, exclusive dealing, tying agreements, mergers and interlocking directorates were specifically identified as illegal if they substantially reduced competition or tended to create a monopoly.

the opposite. Whether alliances are anti-competitive or not depends on the structure of the market. If a large number of competitors operate in the market with the market share distributed evenly among them, then the alliance will not be in a position to raise fares. If however the market is highly concentrated, then an alliance can allow the partners to gain control. This is particularly so when the only carriers on the route are those designated under the bilateral. For example, Swissair and SAS, formerly EQA partners, co-operated on the Copenhagen-Zurich route which lead to the termination of Fifth-Freedom service provided by Thai Airways and Alitalia in 1991. Transatlantic alliances are also causing alarm. Many expect that the BA-AA alliance which enjoys 60% of the US-UK market will raise fares on that route after the alliance is formed. On the transatlantic, an interesting situation seems to be developing whereby competition is more between transatlantic alliances than between individual carriers. Indeed, competition between Lufthansa-United, KLM-Northwest, BA-USAir/AA, and to a lesser extent SAS-Continental and Delta-Swissair/Sabena/Austrian Airlines is hotting up. In general, competition between gateways is gradually decreasing while competition in origin-destination (O-D) markets is increasing.

4.5.2.1 Code-sharing and competition

The key issue concerning airline competition is code-sharing which is the backbone of all strategic airline alliances. Though generally in favour of code-sharing, the US DoT is concerned about the harmful effects of this practice especially where the marketplace becomes dominated by a few large carriers that are not effectively competing with each other or which prevent market entry by other airlines (GAO, 1994). For that reason, it has created the Office of Aviation and International Economics to monitor the long-term effects of code-sharing. In addition, certain conditions are imposed upon the code-sharing partners. For example, the BA-USAir code-share was allowed only after USAir agreed to relinquish to other US carriers its operating authority over the code-shared routes where it was an existing or potential competitor to BA (Burton and Hanlon, 1995). The EU is also in favour of code-sharing since it improves capacity utilisation and can therefore improve the performance of airlines (Comite des Sages, 1994).

Through the use of CRS rules and Articles 85 and 86, the EU considers that it is possible to regulate code-sharing to safeguard its anti-competitive effects[26].

In order to assess the effect of code-sharing on competition within the EU, the change in the level of competition on routes where BA, KLM and Lufthansa practice code-sharing is monitored. These airlines are selected as they are the leaders in the use of intra-EU code-sharing. Only direct routes originating from London (Heathrow and Gatwick), Amsterdam and Frankfurt are considered. The level of competition is measured by the average number of competitors (n) for the sample of code-shared routes. The periods June 1991 (when code-sharing was virtually non-existent on intra-EU routes) and June 1996 are compared. The results are given in Figure 4.22. In all three cases, code-sharing can be observed to lead to a decrease in the level of competition.

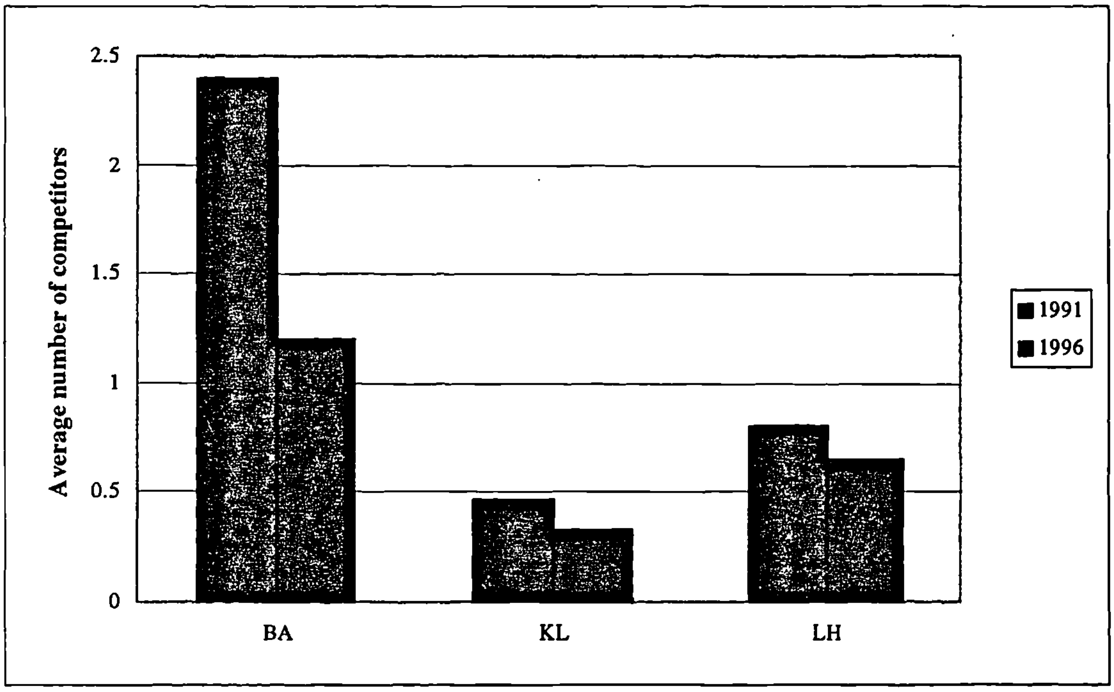


Figure 4.22 Change in the level of competition on intra-EU code-shared routes
Source: ABC Guide, June 1991 and June 1996

[26] For an extensive analysis of the circumstances under which code-sharing and various other types of airline co-operation can be sanctioned under Articles 85 and 86, the reader is referred to Houtte (1993) and Atkins (1994).

4.5.2.2 Code-sharing and CRS

Code-sharing can negatively affect competition through CRSs. Indeed, code-sharing is used by alliances to clutter CRS screens by double or even triple listings[27] of the same flight. This pushes competitors' flights onto the next screen which is rarely consulted by travel agents[28]. Consequently, the code-share flights are selected even though flight options which are better in terms of connection time, flying time or fares exist. The US GAO therefore recommends that the EU rules on CRS display whereby a code-share flight can be listed only twice should be adopted by the US DoT. British Midland has also issued a code of conduct to eliminate the confusion felt by consumers regarding code-sharing. The points in the code of conduct are given in Table 4.9.

1	All code-share arrangements must meet the criteria that they increase the range of competition and choice available to the travelling public
2	Code-share partners should endeavour to deliver a level of service compatible with an on-line connection operation
3	Time-tables, brochures, advertising and promotional material should identify the involvement of a code-share partner
4	The customer must be informed of the identity of the code-share flight operator, and of any change in gauge, before any booking is made
5	The identity of the code-share flight operator must be retained in the PNR
6	As an absolute minimum, the identity of the code-share flight operator must appear on the ticket. Ideally, the code-share partner's flight prefix and number should be replaced by those of the code-share flight operator
7	When an itinerary is printed, the code-share flight operator's flight prefix and number is mandatory, whereas the code-share partner's flight prefix may be omitted
8	When a boarding card/baggage tag is printed, the code-share flight operator's flight prefix and number must replace those of the code-share partner
9	Marketing airlines must maintain the ultimate responsibility for passenger satisfaction at all times
10	All carriers' staff involved in the delivery of code-share operations must be fully briefed and trained to support all aspects of the code-share product

Table 4.9 British Midland's proposed code of conduct for code-sharing
Source: O'Donovan (1995)

4.5.2.3 Code-sharing and consumers

The practice of code-sharing becomes even more controversial when viewed in relation to consumers. Here again, two schools of thought exist. On the one hand, proponents of code-sharing argue that it offers a number of advantages to consumers, such as a better service, excellent connections, shared frequent flyer programmes and lower fares. The

[27] For example, the flight from Los Angeles to Amsterdam as provided by the KLM-Northwest alliance is listed as follows:
NW36 to Boston, NW38 Boston-Amsterdam
KL 8036 to Boston, KL* 638 Boston-Amsterdam*
NW 36 to Boston, KL 638 Boston-Amsterdam* (Shenton, 1994a)

[28] Studies have shown that travel agents book flights on the first CRS screens as often as 90% of the time (GAO, 1995).

US DoT finds that '....code-share arrangements have become an important element of the aviation landscape, improving the variety and convenience of service options available to the public and enhancing the marketing and efficiency of air carrier operations' (GAO, 1994)[29]. On the other hand, code-sharing detractors argue that such a practice is effectively equivalent to passenger deception (de Groot, 1994; Humphreys, 1994; Shenton, 1994a). Indeed, passengers are not given the real identity of the airline on which they will travel. This can lead to problems when boarding, especially at connecting airports where the code-share partner can not be located. Passengers can also feel dissatisfied when the service quality on the partner's flight does not match that on the airline's flight. This has lead the DoT in 1994 to propose that the identity of the airline which undertakes the flight should be communicated in writing to the consumer. Furthermore, the DoT requires that code-shared flights should be identified by an asterisk on CRS displays. However, de Groot (1994) argues that this is not sufficient because the DoT restricted itself to information disclosure, but did not consider the discrepancy between the advertised product and that offered in practice.

4.5.3 Consumer-related issues

From the above discussion, it can be gathered that alliances can determine the level of service and the fares offered to consumers. A demonstration of the effects was carried out by Youssef (1992) with the SAS-Swissair alliance as example. The results of the study are presented below.

4.5.3.1 Effects on service quality

Youssef considered two aspects of service: (1) quantity of service which includes the number of destinations served, the number of city-pair markets served, service frequency, and average market service frequency, and (2) quality of service which includes average connection time and best connection time. On the whole, the alliance was observed to have lead to an improvement in the quantity of service. The quality of

[29] Data limitations prevented the US GAO from assessing the impact of code-sharing on fares. However, airline executives interviewed argue that code-sharing could result in lower fares in the long run as cost efficiencies are passed on to the consumer and as competition between alliances increases.

service also improved with substantial decreases in average connection time and best connection time. However, when the effects at individual hubs were analysed, there appeared to have been a deterioration of service at Oslo, while service had improved at Copenhagen and Stockholm. Youssef also found that markets with short connection times experienced little or no change in connection time. However, markets with long connection times experienced substantial improvements. Service quality and quantity improvements came mainly from better scheduling of connecting flights and increased inter-hub frequency.

4.5.3.2 Effect on fares

In examining the effect of equity alliances on fares, Youssef tried to find a significant difference between the fare changes in alliance and non-alliance city pair markets. For markets originating from SAS hubs, there was a statistically significant difference in the fare changes so that the alliance had effectively lead to a real increase in fares. However, this was not the case for Swissair's hubs. When the services from SAS' and Swissair's hubs were combined to increase the sample size, the presence of the alliance as a factor explaining fare increases was again significant. Overall, alliance markets experienced a 1.5% fare increase over non-alliance markets.

While Youssef found that fares in alliance non-stop inter-hub routes had risen much more than fares in corresponding non-alliance routes in the same region, his study also showed that fares had fallen in connecting services via the airlines' hubs. Burton and Hanlon (1994) therefore argue that consumer welfare can be raised by alliance formation if the alliance pro-competitive effects outweigh the anti-competitive ones, and believe that in many instances, that is the case. Furthermore, they point out that hub-to-hub routes are likely to be short-haul while hub-to-destination routes tend to be long-haul. Consequently, the consumer gains in terms of costs per seat-mile on the hub-to-destination routes will be more than enough to offset losses on the inter-hub routes. However, this argument can be challenged if applied to intercontinental alliances. In the case of KLM-Northwest for example, the hub-to-hub routes

(Amsterdam-Boston/Detroit/Minneapolis) are much longer than the hub-to-destination routes, especially where the destinations are in the US.

From his findings, Youssef concludes that there should ideally be some fare regulation and greater competition in the inter-hub markets (by permitting liberal Fifth-Freedom service and encouraging new entrants) to break the monopoly of the alliance in those markets. However, he recognises that this would not be a practical solution as fare regulation in the past has lead to poor results. In addition, the hub-and-spoke networks of the alliance carriers will confer them enough market power to prevent entry of new competitors and therefore keep market concentration high. Burton and Hanlon (1995) identify a dilemma when it comes to entry of competitors in the alliance's markets: while entry will be advantageous to consumers, there is the danger that it can negate the economies of density derived from the alliance's hub-and-spoke system, hence leading to a rise in marginal cost per passenger in connecting markets. While this higher cost can be offset by the increased competition level on the market where entry has occurred, lack of additional competition on other through markets can causes fares to rise there. In brief, disbenefits across the whole network of the alliance can result from competitor entry on only one route.

4.5.4 Benefits of alliances-the GRA and GAO studies

Since the airline alliance phenomenon is a very recent one, quantitative studies on them are very sparse. Apart from the study by Youssef, the only other studies are those carried out by the US GAO and GRA Inc. They are discussed in some detail below.

4.5.4.1 The GRA report

Since 1987, regulation requires any code-sharing venture between US and foreign airlines to be approved by the US DoT. Over the years, the DoT has approved a number of such alliances after some type of examination. However, there has been growing criticism that the DoT has allowed code-sharing operations without having a full understanding of them since there have been no broad-based studies of the effects of code-sharing on the US airline industry. For that reason, the DoT has commissioned the GRA to study the effects of code-sharing. The study was to fulfil four objectives, namely

(1) Develop a means of measuring the impacts of code-sharing on the level and distribution of traffic among carriers;

(2) Examine the effects of code-sharing on the costs and profitability of airlines;

(3) Assess the effects of code-sharing on the consumers of airline services; and

(4) Project the future use and impact of code-sharing over the next twenty years.

The methodology developed by the GRA to measure the impacts of code-sharing was based on an econometric market share model. The model was identified by regressing observed market shares of the options available in each market against a set of explanatory variables which included seat shares, average time between departures, fare, average elapsed time of flights, a service quality proxy and a set of carrier-specific dummies. The exercise used data for the first quarter of 1994 from BA/USAir and KLM/Northwest code-sharing markets since those alliances were the most developed ones at that time.

However, the model carried with it a certain number of limitations as recognised by the GRA. First of all, it assumed a fixed market size; market stimulation as a result of improved service quality is considered to be virtually non-existent. Secondly, the model did not incorporate the response of competing carriers to code-sharing. Thirdly, the model could not be used to measure code-sharing impacts in small markets behind gateways owing to data limitations.

The results of GRA's analysis (Table 4.10) indicate that substantial benefits are to be gained from code-sharing. Indeed, the use of code-sharing increases market share across all markets sampled by approximately 8 percentage points and 11 percentage points for BA/USAir and KLM/Northwest respectively.

	Estimated market share (%)	
	BA/USAir	KLM/Northwest
Without code-sharing	2.9	34.4
With code-sharing	11.2	45.0

Table 4.10 Estimated benefits of code-sharing
Source: GRA, Inc. (1994)

The model was also used to predict the monetary benefits accruing to the carriers involved in the partnership, as well as the benefits going to the consumers. Annualised impacts of the BA/USAir and KLM/Northwest code-sharing alliances based on the first quarter of 1994 are given in Table 4.11.

Carrier	Revenue ($mn)	Cost ($mn)	Airline surplus ($mn)	Consumer surplus ($mn)
USAir	7.9	2.3	5.6	US: 4.9
BA	45.8	18.6	27.2	Foreign: 5.4
KLM	18.6	8.0	10.6	US: 13.0
Northwest	24.6	8.5	16.1	Foreign: 14.1

Table 4.11. Estimated benefits of the BA/USAir and KLM/Northwest code-sharing alliances
Source: GRA, Inc. (1994)

These results show that the BA/USAir alliance has largely benefited BA rather than USAir. This is because the agreement allows only BA to market certain USAir flights as its own and not vice versa. Furthermore, it is BA that does all the long-haul flights between USAir hubs and London-Gatwick[30]. However, the disproportionate benefits flowing to BA have to be viewed in the light of its $400mn investment in USAir when the latter was in great need of cash injections. The GRA model also revealed that the BA/USAir alliance was benefiting foreign carriers ($26.4mn) at the expense of US carriers (-$21.1mn). The distribution of profits is more balanced in the case of the KLM/Northwest partnership. The alliance also benefited both foreign ($0.4mn) and US carriers ($2.0mn). The example of the KLM/Northwest alliance indicates that US carriers can benefit substantially from code-sharing even with a carrier from a small

[30] With aircraft wet-leased from USAir.

country. Both alliances are observed to have benefited consumers, both US and foreign.

The impression of the GRA (though not formally spelt out) is that code-sharing is here to stay for the next twenty years or more. The GRA recognises that growth in markets can make point-to-point service attractive, and consequently decrease the attractiveness of code-sharing. However, there are a number of forces which will continue to encourage airlines to adopt the code-sharing strategy. One of them is the economies of scope and density which accrue to large networks. Since network size can not be currently increased by mergers and acquisitions, airlines will tend to use code-sharing as a tool to expand their networks. International hubbing and spoking is another factor favouring code-sharing. According to the GRA, code-sharing increases the value of a concentrated hub-and-spoke network in that it makes it easier to connect it to another network. Thus code-sharing is again an effective means of building large networks to reap economies. The GRA therefore predicts that foreign carriers will tend to concentrate services at the hubs of their US code-sharing partners. However, whether this will be accompanied by a reduction of service at the other non-code-sharing hubs remains to be seen. The GRA also predicts that code-sharing will become increasingly prevalent in Asia for this is the fastest-growing region. As US airlines attempt to partake in those traffic flows, they will form more and more code-sharing alliances with Asian carriers.

The GRA study had been largely criticised namely by Shenton (1994b) and Jennings (1995). Shenton argues that it tends to inflate the importance of code-sharing. This is achieved by failing to compare the benefits of code-sharing with airlines' revenues and profits which are much larger. For example, the $37.5mn benefit to consumers is negligible compared to the $10bn which they spend on transatlantic tickets. Also, benefits to the airlines studied is estimated to $7.7m which is negligible compared to their transatlantic revenues. To Shenton, the GRA study has effectively shown that benefits that are derived from code-sharing are very small. According to him, the real value of code-sharing comes in the other alliance practices accompanying code-sharing, such as the effective integration of operations.

Another of Shenton's criticism is that the GRA treats the negative effects of code-sharing as unimportant. Passenger deception, CRS screen clutter, and the anti-competitive effects of code-sharing are all mentioned in the study. However, little consideration is given on how to redress these problems. The final criticism concerns the theory used by the GRA used in defining its econometric model: that traffic from one system to the other occurs via two hubs, with code-sharing partners feeding the hubs at both ends. According to Shenton, this is not ideal to the consumer as the alliance forces him/her to make double connections. Then, hubs are becoming increasingly congested in Europe so that a hub bypass system could be attractive. Finally, many airlines in Asia are not interested in the double hub strategy; rather, they favour gateway-to-gateway code-sharing.

According to Jennings (1995), the GRA study is too restrictive and can not be extrapolated to real life. Indeed, only 46 markets operated by two airline alliances are analysed, no account is made of the influence of non-US airline competition, market growth is not considered, and US airline competitive reactions are not taken into account. Jennings argues that the GRA study gained acceptance by the US DoT only because it supported DoT's favourable view about code-sharing.

4.5.4.2 The US GAO report

The US GAO study on airline alliances was commissioned by the US Chairmen and Ranking Minority Members of the Senate Committee on Commerce, Science, and Transportation and its Subcommittee on Aviation. It was spurred by the increasing number of code-sharing alliances being formed between US and foreign airlines which were allowing the latter access to the domestic US market. The objectives of the GAO study were to assess (1) the benefits, in terms of increased passenger numbers and revenues reaped by the alliance partners (both US and foreign), and (2) the impact that the alliances had on other US airlines and consumers. A third objective was to identify and examine other alliance issues which had been omitted from the US DoT policy statement and regulatory actions recently proposed.

The study was performed by analysing data provided by US and foreign airlines on passenger traffic and revenues, and by interviewing officials from the Justice Department as well as airport representatives. Representatives of 7 US and 13 foreign airlines were interviewed to gather their opinions and also to enable access to internal data. This was deemed necessary because the data provided by DoT carried with it severe limitations, namely non-differentiation between code-sharing passengers and 'normal' passengers. Furthermore, foreign airlines allied to US airlines are not required to report data on code-share traffic though that traffic either originates or is bound to the US. Air transportation officials from foreign countries were interviewed to obtain a foreign perspective concerning the issues examined. The implications of alliances on CRS listings were analysed via extensive interviews of travel agency officials and EU representatives. This was complemented by an examination of DoT's policy statement and proposed rules concerning consumer notification and of DoT's previous orders approving code-sharing alliances.

In its assessment of the benefits of alliances to the partners, the GAO report presents the estimates of the increases in passenger traffic and revenues in 1994 for three strategic airlines which make extensive use of code-sharing: KLM-Northwest Airlines, BA-USAir, and Lufthansa-United Airlines. These estimates are given in Table 4.12. Incidentally, one can observe that these results differ quite markedly from those of the GRA.

	KLM	NWA	BA	USAir	Lufthansa	UAL
Increase in passenger traffic (000)	150	200	68	n/p	n/p	220
Increase in revenues ($mn)	100	125-175	100	20	n/p	n/p

Table 4.12. Benefits of strategic airline alliances to participating airlines
Source: GAO (1995)
(n/p: figures not provided)

The KLM-Northwest alliance was found to be the one producing quite sizeable benefits for both parties. This was attributed to the broad scope of the code-sharing network of the alliance. In addition, the KLM-Northwest alliance benefits from antitrust immunity which allows it to achieve a high level of integration without fear of legal action from competitors. The airlines in the partnership were observed to benefit fairly equally from the alliance. This is because resulting benefits are divided on the basis of an agreed prorated formula that takes into account the number of miles flown under the alliance, and also because both airlines fly long-haul routes as part of the alliance.

The BA-USAir alliance, on the other hand, was found to benefit BA more that USAir. This is because under the current arrangement, only BA lists USAir's flights as its own and keeps most of the revenues resulting from code-sharing. BA also benefits extensively from increased interlining traffic from USAir-USAir/BA interline traffic increased by 60% from December 1993 to December 1994 (GAO, 1995). The $20m additional revenues to USAir come mainly from increased interline traffic resulting from FFP links with BA and also from the wet lease of three aircraft to BA for transatlantic operations.

The Lufthansa-United alliance involves extensive use of code-sharing linking 25 US cities to 30 European and Middle East cities. According to Lufthansa and United representatives, the alliance is generating substantial revenues for both airlines. As the level of integration rises, United predicts code-sharing to bring up to 1000 additional passengers a day.

All three alliances claimed that the additional traffic and revenue was the result of increased competition between alliances and other airlines as well as with other alliances. However, representatives of other airlines flying internationally stated that the additional traffic to the alliances had been diverted from them, and was causing a decrease in their revenue. Unfortunately, data was not available to the GAO to enable them to quantify the extent of those losses. The lack of appropriate data also prevented the GAO to determine whether US airlines were losing more than foreign airlines, and whether increased competition had lead to increased consumer benefits in terms of lower fares.

The GAO also studied other alliances which were more restrictive in nature than the strategic alliances. These were termed regional and point-specific alliances in that they connect a limited number of routes. Examples of such alliances are the United-Ansett and United-British Midland tie-ups, and the code-sharing alliance of Delta Airlines with Virgin. The GAO study indicates that such partnerships do yield payoffs. However, these benefits vary depending on the level of integration. Point-to-point alliances are prone to failure because the airlines end up competing with each other rather than effectively integrating their operations.

From the study, the GAO came up with five recommendations:

(1) US airlines should be required to identify passengers who travel on code-shared flights and report which airline operated the code-shared flights. This will be useful for future studies on the effects of code-sharing and alliances;

(2) Recommendation 1. should be extended to foreign airlines code-sharing with US airlines;

(3) The DoT's economic unit newly formed to examine alliance effects should use DoT's data and airlines' data to determine the effects of alliances on consumer welfare prior to approval of all code-sharing alliances involving US airlines. It has not been possible for the GAO to perform this analysis because of the inappropriateness of the DoT existing data;

(4) The KLM-Northwest alliance should be used to determine whether antitrust immunity could be made available for alliances in markets that allow for significantly increased access for US airlines. The main reason viewed by many for the success of the KLM-Northwest alliance is the immunity from antitrust regulation which it enjoys[31]. Thus, antitrust immunity could be used as an incentive to open up foreign markets for US airlines;

(5) The number of listings of the same code-shared flights in CRSs should be limited to two. This recommendation comes as a result of an examination of DoT's policy statement where the GAO found no mention of a limit on the number of times a flight

[31] DoT and Justice Department officials argue that the two carriers could have achieved the high level of integration without antitrust immunity as they are not significant competitors on most routes. However, fear of legal reprisal from competitors could have hindered their advance.

is listed on CRSs. The GAO reviewed the first screen for 17 international city-pairs on the Worldspan and Apollo systems and found that 19 percent of them contained multiple listings of the same flight. In many cases, competing flights, which were better than the code-shared flights in terms of fares or elapsed time, were pushed to the next screen.

Jennings (1995) considers the GAO study to be the most in-depth study on code-sharing to date. According to her, the study takes a broader perspective than the GRA study which is more academic in nature. However, she recognises that unlike the GRA, the GAO had access to better data. The GAO report effectively shows that code-sharing is producing benefits in terms of revenue and market share, and it recognises that some of the benefits could come from non-code-share sources such as increased interline traffic. The GAO study also quantifies the losses of US airlines caused by the BA-USAir and KLM-Northwest alliances. Jennings points out that this opposes DoT's belief that code-sharing is a perfect marketing tool in ensuring airline rights around the world.

4.6 Conclusion

Since the beginning of the decade, the phenomenon of airline alliances has been progressing rapidly. Most of the alliances involve European and US carriers. US and European alliances are mostly centred on marketing benefits, while Asian carriers focus more on cost-cutting strategies. The involvement of equity purchases is becoming increasingly common because it is considered as the 'glue' which holds the alliance together.

Over the past years, the rate at which airlines changed partners was quite high. However, this trend seems to have slowed down as airlines have settled with adequate partners. Five main groupings have evolved.

Airline alliances bring totally new issues to the airline industry. Increasingly, they are becoming embroiled into political negotiations. The US in particular is using antitrust immunity for alliances as a means to promote its 'Open Skies' aviation policy.

Antitrust protection is very much sought by current alliances between US and European airlines because it is believed to be key to alliance success.

Opinions about the effect of alliances on competition diverge. However, on intra-EU routes, the number of competitors on code-shared routes fell, indicating that code-sharing is harmful to competition. It seems that the situation is slowly evolving towards competition between global alliances rather than between individual carriers as the need to be affiliated to an alliances becomes urgent (Oum *et al*, 1993).

One study has shown that alliances generally lead to service improvements in terms of service frequency and connect times. However, fares are very likely to rise. Two studies have investigated the effects of code-sharing between US and European carriers. Both indicate that code-sharing leads to substantial benefits to the airlines concerned in terms of market share and revenues. Whether these benefits were evenly distributed between the airlines depended on how the alliances were structured.

Having described the change in the structure of the airline industry, one can wonder why airlines have suddenly adopted the collaborative strategy. Furthermore, if the need to co-operate and operate globally was felt, why did airlines not merge? The next chapter will attempt to answer these questions.

5. FORCES DRIVING AIRLINE ALLIANCE FORMATION

Introduction

The purpose of this chapter is to identify the factors which have lead airlines to increase their dependence on the collaborative strategy. An understanding of those forces is essential to explain why airlines have chosen to form alliances instead of adopting the other inter-firm organisational forms which were presented in the previous part of this thesis. In addition, an assessment of how strong those drives are will give an indication of whether airline alliances will continue to exist in the future, or whether they are a transitional inter-organisational form preceding the formation of global mega-carriers.

The chapter is organised into two main parts. In the first part, the general theories which have been developed in the business and social sciences to explain the formation of alliances are reviewed. The applicability of the theories to the airline industry is then analysed. In the second part of the chapter, an alternative model of airline alliance formation which incorporates regional and world-wide socio-political and economic occurrences is proposed.

5.1 General Theories of Alliance Formation

What are the forces which have lead firms to adopt the collaborative strategy in preference to the go-it-alone strategy? The business literature on alliances is replete with answers to this question. All views are encompassed in what are considered as two of the most prominent treatments of the trend of alliance formation: the 'knowledge-link' theory of Badaracco (1991) and the 'globalisation' theory of Ohmae (1989). Both theories are presented in this chapter. One will observe that they tend to be biased towards manufacturing industries, pivoting mainly on technology advancements. This is one of the impediments to their applicability to airline alliances.

5.1.1 The 'knowledge link' theory

The knowledge-link theory of Badaracco (1991) explains the emergence of partnerships by the need to share and exploit what Badaracco terms 'embedded knowledge'. He defines this as expertise characteristic of the firm possessing it and which can not be easily transferred to other firms though it has strong commercial value and is very much sought by them. The non-transferability of embedded knowledge then leads firms to form alliances (knowledge links) and the firms are thus able to exploit their knowledge complementarities.

Burton (1994) has criticised the knowledge-link theory arguing that it is not sufficient in and by itself to explain the contemporary proliferation of strategic alliances. Indeed, the desire to have access to the embedded knowledge of another firm does not necessarily warrant the formation of alliances. Mergers and acquisitions could also provide access to such knowledge. In fact, mergers and acquisitions could be better options to alliances in that the firm secures exclusive access to the embedded knowledge of the partner. This argument would indicate that an alliance is the second option and is selected only when the merger strategy is economically or politically constrained. Burton takes the BMW-Rover example to illustrate his point. In order to access the embedded knowledge of small-car engines and off-the-road vehicles possessed by Rover, BMW went for an outright acquisition of Rover instead of seeking an alliance with it.

5.1.2 The 'globalisation' theory

The globalisation theory developed by Ohmae (1989) rests upon the argument that it is the sheer scale of contemporary global industries and markets that requires the adoption of alliances. A graphical representation of the theory is given in Figure 5.1. Basically, the theory identifies three factors which have contributed to bring about the urge to co-operate in firms. These are: (1) The 'Californiazation of needs' (Ohmae's terminology), (2) the dispersion of technology, and (3) the growing importance of fixed costs.

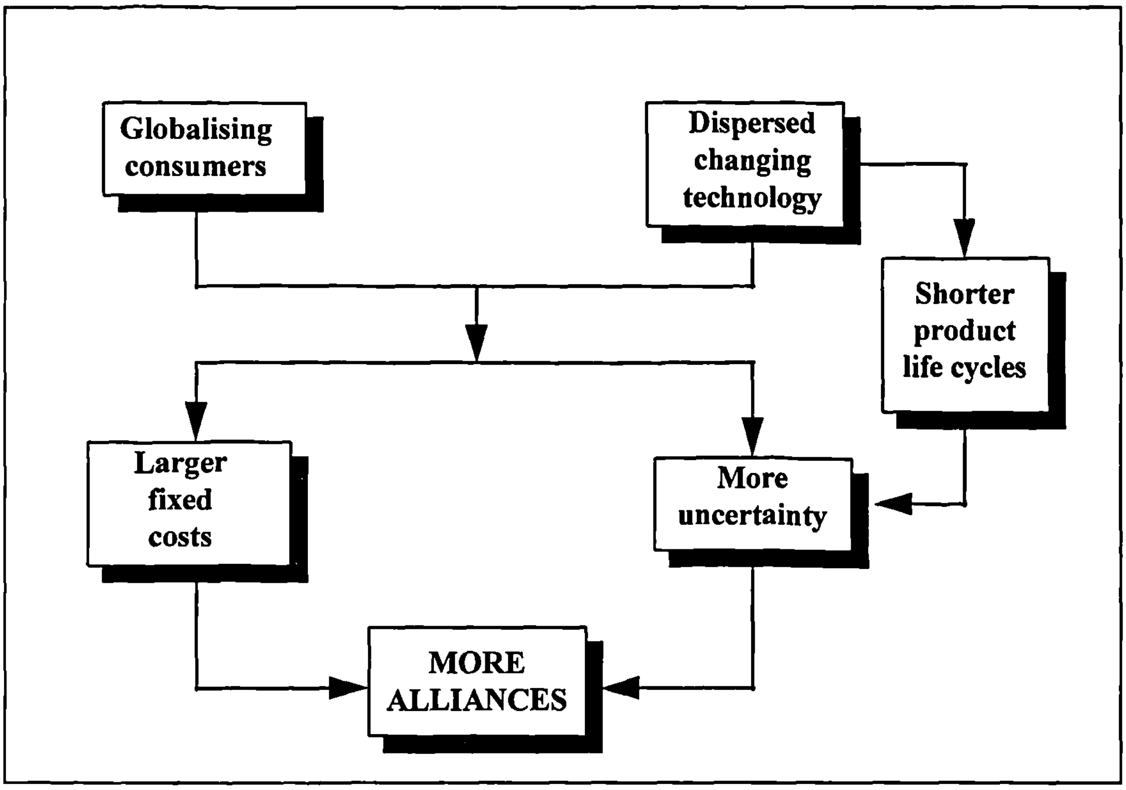


Figure 5.1 Ohmae's globalisation theory of alliance formation
Source: Burton (1994)

The term 'Californiazation of needs' refers to the convergence of consumer needs and preferences so that everyone in the world wants to live similar lifestyles and therefore desires the same kinds of products[32]. This global market integration is the result of a more efficient dissipation of the same information world-wide and of technology advances coupled with new requirements of users which raise lifestyles to similar standards (Lewis, 1990). The technology advances in communication and transportation have eased the movement of information and goods and also of technology transfer.

Today's technological products have reached such a high level of sophistication that their manufacture requires access to numerous critical technologies in which a single

[32] Hence the term 'Californiazation' referring to the increasing desire of everybody to shop in California.

firm can not maintain a leading competence simultaneously. As technology becomes dispersed among a number of companies. co-operation becomes essential for the development of new products. The increasing technological interdependence and the convergence of consumer needs and incomes in the leading regions of the world has lead to collaboration in research and development (R & D) so that duplication of efforts is minimised and global scale can be achieved (Lewis, 1990).

Ohmae also argues that as products become global, they incur immense fixed costs. Increased automation has transformed manufacturing into more of a fixed-cost than a variable-cost activity. So is the same for R & D and for the building of global brand reputation and global sales and distribution networks. Ohmae therefore concludes that '....this new logic forces managers to amortise their fixed costs over a much larger market base..... This logic mandates entente-alliances that both enable and facilitate global contribution-based strategies' (Ohmae, 1992; p. 41). The advantages of partnerships go even further as they also enable managers to define strategies that will allow them to maximise the contribution of their respective fixed costs. Ohmae concludes his article by arguing that the globalisation wave is far from over and only properly-managed alliances will enable firms to wither the uncertainties it brings along in the business world.

A salient omission in the two theories of alliance proliferation is the heightened level of competition world-wide (Kanter, 1989; Jorde and Teece, 1989). Change is indeed happening in the business world at an accelerating rate owing to the cumulative impacts of technology, improvements in information technology, transportation sytems and management systems (Jarillo, 1993). This is complemented by trends towards deregulation and privatisation which leave companies to fend for themselves. Thus, such levels of competition have currently been reached that more than cost-cutting is warranted in order to remain competitive, not to mention survive. The solution has been to adopt a radical organisational change (Jarillo, 1993), the result of which is the emergence of strategic alliances. A similar view is adopted by Howarth (1994) after analysing high-tech companies in Australia.

5.2 Alliances v/s Other Means of Value Creation

The two alliance theories have identified the forces which have driven airlines to ally. However, one could ask why is it that firms have selected alliances instead of organic growth or mergers when subjected to these forces. The following sections attempt to provide an answer to this question by analysing the limits of organic growth and of mergers.

5.2.1 Limits to organic growth

Organic growth refers to increasing firm size and scope by using internally-generated resources. Doz (1993) identifies two limits to organic growth: its slowness and the resistance to strategic change which is inherent to it. He argues that in a relatively stable environment characterised by comparatively little overall organic growth, the opportunities for fast corporate growth are scarce, the resources take too long to mobilise and the learning processes required to develop new competencies are too slow. Conversely, in a rapidly-changing environment, a position reached through organic growth can be lost very easily as such companies are unable to readjust their perspectives and accumulated skills fast enough to suit the new conditions. It therefore becomes extremely difficult to engage successfully in a major strategic transformation.

5.2.2 Limits to mergers and acquisitions

Doz (1993) observes that strategic alliances are created simply because restrictions exist regarding mergers and acquisitions. He identifies five such restrictions:

(1) Public policy restrictions imposed by governments to protect their 'national champions'. This is particularly true in the airline industry;

(2) Antitrust restrictions to prevent monopolies from arising;

(3) The absolute size and complex patterns of ownership of the companies targeted for merger or acquisition;

(4) The difficulty to put a price on the acquisition candidate; and

(5) The increasing scarcity of attractive acquisition candidates.

Furthermore, he notes that mergers and acquisitions often fail owing to a series of problems which arise when post-merger integration is attempted. This is particularly so when a management interface is created between the two companies. He argues that, in most cases, that interface is poorly designed and is not always appropriate to the nature of the benefits sought from the venture. Furthermore, mergers and acquisitions burden the resulting enterprise with excessive fixed costs, cumbersome management structures and a large debt (Achrol and Scheer, 1990).

Jordan (1988) has studied airline mergers in the US and Canada to find out whether their potential benefits are achieved. One of his findings is that mergers lead to increased unit costs and had negative effects on profits, unless measures were taken to rationalise the combined network rapidly after the merger was formed. Another conclusion of his analysis was that the traffic carried by the combined entity either declined or grew at a slower rate than that of similar unmerged carriers. These findings show that airline mergers can lead to several problems which affect traffic volumes and profits adversely. Furthermore, the assumption that mergers yield increased market power without incurring substantial costs is misleading.

5.2.3 The attractiveness of strategic alliances

Confronted to all those restrictions and the high failure rates of mergers and acquisitions, the best alternative for managers has been to develop strategic alliances. Without having to experience the huge expenses carried by an acquisition, they have been able to create a mix of resources that meets their separate and mutual objectives. Indeed, strategic alliances decrease valuation uncertainties and thus the risk of overvaluation. They provide a relatively low-cost opportunity to learn about the value of the partner's skills and resources before having to make a major commitment. In addition, the very process of collaborating can reveal better ways of creating value without incurring huge costs. Acquiring or merging with a company requires the shouldering of that company's problems as well as benefiting from its strengths. This is not so in alliances which can allow the reaping of the benefits exclusively while the individual problems of the partners are not shared. In the same way, partnerships may solve the problem of unnecessary assets accompanying mergers and acquisitions. Alliances are also more flexible than acquisitions where control is concerned. Though an acquisition offers full control to the purchaser, it incurs the costs of resentment and lack of motivation on the part of the personnel of the acquired firm. A loss of key executives can result (Lewis, 1990). Thus, the value of the acquired firm can fall if its people constitute one of its major assets, thus negating the goal of the take-over. An alliance, on the other hand, can offer shared control and will not incur such costs.

5.3 Applicability of General Alliance Theories to the Airline Industry

Are the general theories outlined above capable of explaining the proliferation of airline alliances? To answer this question, the applicability of the knowledge-link and globalisation theories to the airline industry is examined. The issue of airline mergers and organic growth is considered later on when formulating the alternative model of airline alliance formation.

5.3.1 Relevance of the knowledge-link theory

It would seem that Badaracco's theory is less appropriate in explaining the proliferation of airline alliances than is Ohmae's theory. Indeed, the former is based on knowledge which is of greater relevance to manufacturing industries where the cost of acquiring expertise is reaching tremendous proportions. The airline industry is a service industry and is not so much concerned with knowledge. Instead, airlines are more concerned with the existing assets of their potential partners such as existing network size and hub location which will enable them to achieve economies of scope and density. Where knowledge could become important is in the alliances between major and domestic/regional carriers. The latter have the expertise to operate the thin short-haul routes which the majors do not possess, but which they can acquire by allying with them. However, it would seem that the major airlines are not interested in gaining the knowledge in order to eventually operate the routes themselves. Instead, they are more content in letting the domestic/regional airlines to their markets and continue benefiting from feed. Badaracco's theory may become relevant in the case of alliances between majors geared towards maintenance functions. However, in the current alliances, the airlines are more interested in making use of the maintenance infrastructure of their partners to avoid the fixed costs of setting up their own maintenance facility rather than in acquiring their maintenance expertise. Viewed from that perspective, these alliances effectively fall under the fixed-cost portion of Ohmae's theory.

5.3.2 Relevance of the globalisation theory

Of the three pillars on which rest Ohmae's globalisation theory, the growing importance of fixed costs can be considered to be the most relevant to the emergence of airline alliances. Dispersion of technology is recognised to have been the unique driving force behind certain airline alliances in the past (Burton and Hanlon, 1995), examples being KSSU and ATLAS which were set up to manage the maintenance functions of the airlines in the partnership. However, such arrangements are now subset of broader marketing alliances.

In order to test the applicability of Ohmae's theory to the airline industry, the fixed costs of selected allied airlines in Europe, the US, and the Asia/Pacific region is computed over a period ranging from 1983 to 1993[33]. Costs are in real 1983 terms and are presented as an index (1983 ≡ 1.00) in Figure 5.2. From the latter, the trend of increasing fixed costs of airlines in all three world regions over the last decade is obvious. As from 1990, fixed costs either start increasing at a slower rate (Asia/Pacific and US) or to decrease (Europe), possibly as a result of alliance formation. This analysis shows that the fixed cost portion of Ohmae's theory holds for airline alliances.

[33] The selection process was based mainly on data availability. The selected European airlines are : British Airways, British Midland, Lufthansa, Iberia, Austrian Airlines, Air France, TAT, Swissair, SAS and KLM. The selected Asian/Pacific airlines are: Qantas, Malaysian Airlines, SIA, Thai, and Japan Airlines. The selected North American airlines are: American Airlines, Continental Airlines, Delta Airlines, Northwest, United, USAir, Canadian Airlines International and Air Canada. Cost data was obtained from the *ICAO Digest of Statistics-Financial Data*, and Consumer Price Indices were extracted from the *European/International Data and Statistics*, Euromoney Plc. Missing cost data was estimated from a time series linear regression. The models for each of the airlines had a high explanatory power with R^2 values ranging from 63% (Singapore Airlines) to 97% (Japan Airlines). F-statistics were highly significant. Only exceptions were Lufthansa, Air Canada and Air France with R^2 values of 31%, 52% and 42% respectively.

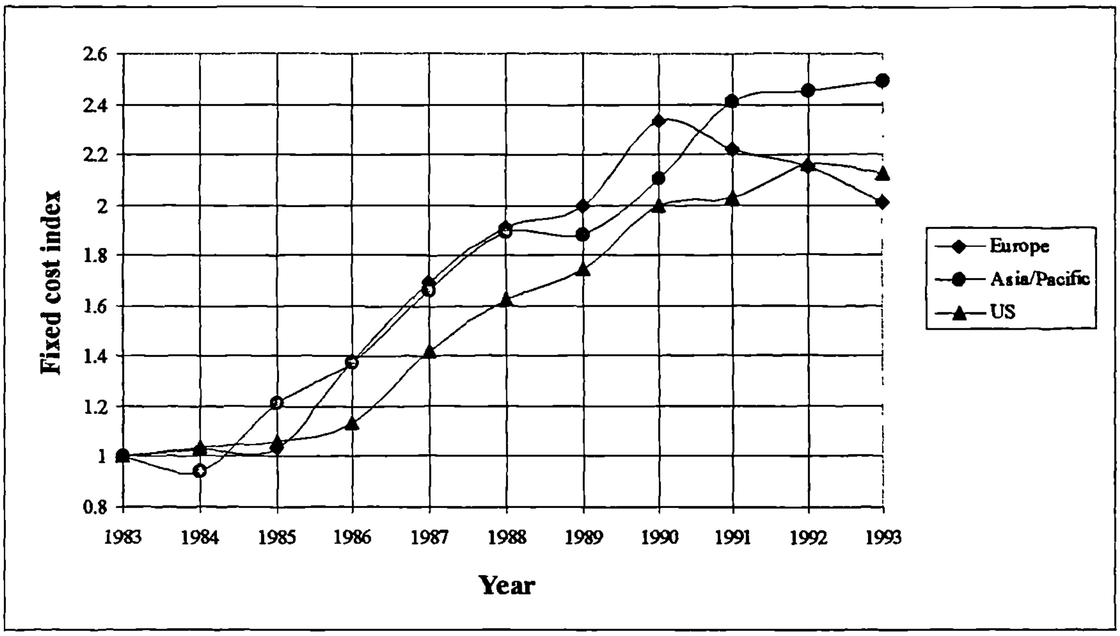


Figure 5.2 Variation of airline fixed costs
Data extracted from the ICAO Digest of Statistics
Note: costs in constant 1980 terms; 1983 = 1.00

Basing himself on the work of economists Baumol *et al* (1982) on perfectly contestable markets, Burton (1994) argues that sunk costs would be more relevant to Ohmae's theory. A source of sunk costs in the airline industry could be the aircraft fleet. However, even then, an airline can lease aircraft instead of purchasing them outright. Moreover, if the airline does purchase aircraft, it can sell them anywhere in the world if they are no longer required. Therefore, costs in aircraft acquisition are not strictly sunk in nature. Burton and Hanlon (1995) also observe that, apart from aircraft, global advertising and CRS developement, there are practically no other sources of sunk costs in the airline industry: airport authorities provide runways and terminals, air traffic control and navigation services are either under the control of governments or private companies so that airlines do not have to invest in infrastructure. Therefore, the sunk cost element is only a small proportion of total airline costs. This argument leads to the conclusion that Ohmae's theory, in and by itself, can not explain airline alliance formation totally. Other underlying forces to the emergence of airline alliances exist. They are identified in the alternative model of airline alliance formation which follows.

5.4 Alternative Model of Airline Alliance Formation

The approach adopted in trying to explain the formation of strategic airline alliances is to analyse the environment in which airlines operate to identify the socio-political and economic generators of change. This follows from Hawley (1950) who argues that the activities of each and every organisation are attempts to adjust to their environment.

The waves of deregulation and liberalisation in certain parts of the world, airline privatisation, the globalisation of air transport, and world-wide economic changes are identified as the external phenomena which interact to create an environment conducive to airline alliance formation. The interaction, conceptualised in Figure 5.3, theorises that those processes have acted along three dimensions: enhanced competition, increased environmental uncertainty, and escalating costs.

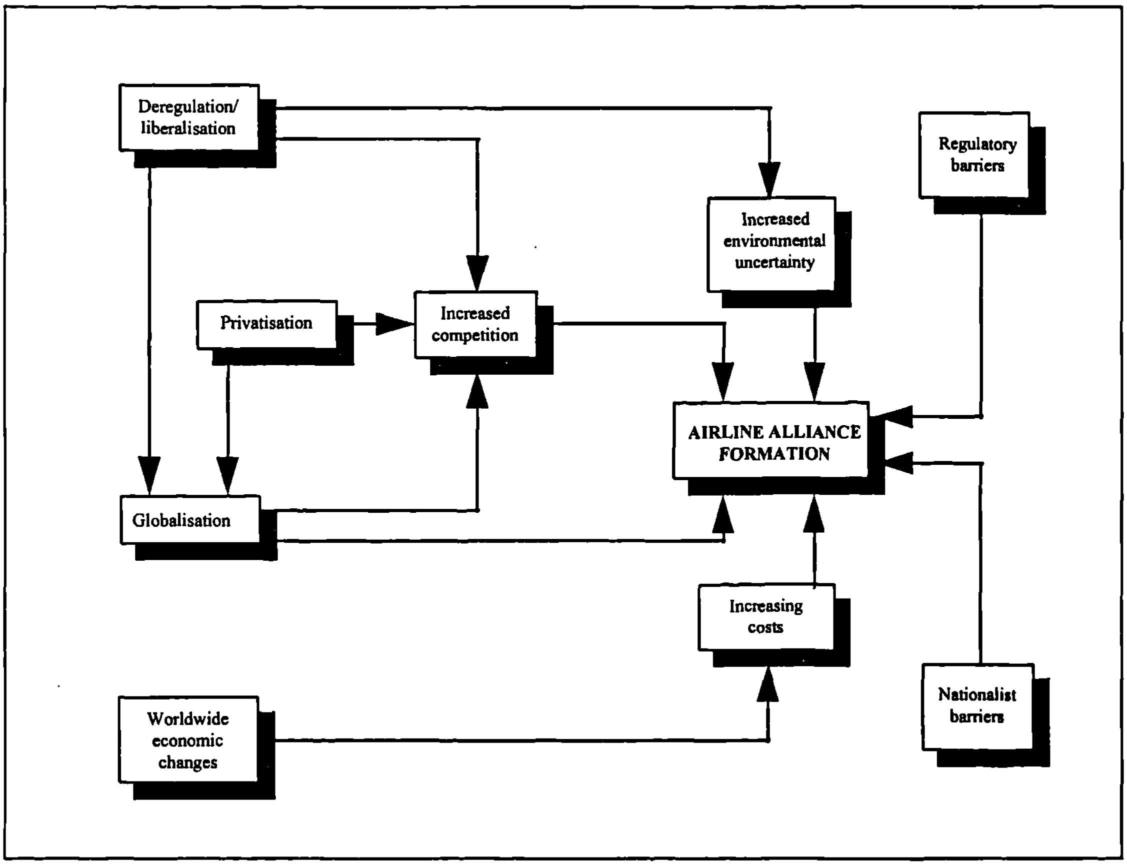


Figure 5.3 Conceptual model of the formation of airline alliances

The constituent parts of the model and their relationship with alliance formation are discussed next.

5.4.1 Air transport deregulation and liberalisation

Deregulation of air transport is in progression throughout the world. Initiated in the US by the Airline Deregulation Act in 1978, it was followed by deregulation of domestic services in the UK, Canada, Australia and New Zealand. It has recently been phased into Europe, albeit in a toned-down version, via the three Liberalisation Packages. Even countries in the tightly-regulated Asian/Pacific region are starting to move towards deregulation (Cheng, 1992). For example, Singapore has adopted a national policy of liberalisation and strongly supports the liberalisation of market access and the ceasing of government intervention in the determination of the airlines to have access to routes. Taiwan adopted a national aviation policy of limited deregulation in 1989. Vietnam is progressing towards opening its skies and allowing foreign airlines into its markets. Association of South East Asian Nations (ASEAN) countries, including Indonesia, Thailand, Malaysia, the Philippines and Borneo have accepted to take measures to partially liberalise their national airline industry and accept liberal bilateral air transport agreements. Though these changes have occurred mostly on a national basis, they are a precursor of future changes bearing more international tendencies.

Basically, deregulation policies introduce free pricing, full access to routes and full freedom to start an airline provided financial soundness and safety requirements are met. Via free access and liberal pricing, deregulation and liberalisation effectively lead to a stepped-up competitive environment. Free access sharpens the threat posed by new entrants: in the ten-year period following US deregulation, 210 new airlines were certificated in the US (Pugh, 1989). However, the US experience has shown that these new airlines are either swallowed up by the majors or go out of business very soon. In Europe, liberalisation has not lead to the creation of a large number of new airlines as was expected. Nevertheless, the threat of entry itself can be argued to contribute in creating a more competitive environment, according to the 'contestability' theory advanced by Baumol *et al* (1982). Entry is also possible by the existing carriers in order to compete with incumbents on attractive routes. The increase in competition also results from the liberal pricing policy to a great extent.

After breaking monopolies on markets, airlines are able to undercut competitors' fares in order to gain market share. In many cases, this has resulted in excess capacity and uneconomic pricing which have caused yields to spiral downwards.

After deregulating its own domestic market, the US attempted to export the 'Open Skies' idea world-wide (GAO, 1995). As a consequence, over twenty countries signed liberal bilaterals with the US (Dresner and Tretheway, 1992). These agreements allowed the carriers freedom in the fields of capacity, route entry and pricing. This lead to an increase in competition on international routes and started the globalisation of air transport. The issues of 'Open Skies' and alliance formation have recently become intertwined as the US uses antitrust immunity for alliances in exchange for 'Open Skies'. The KLM-Northwest alliance, for example, was granted antitrust immunity only after the Netherlands opened its skies to US carriers. Likewise, the issue of 'Open Skies' forms part of the negotiations for approving and granting antitrust immunity to the British Airways-American Airlines alliance.

5.4.2 Environmental uncertainty

Prior to deregulation, the air transport industry was relatively stable and predictable owing to clearly-defined rules. The advent of deregulation and liberalisation eliminated this element of stability and brought in dynamism and uncertainty. The consequent unpredictable and dynamic nature of the environment affected the airlines' decision-making capabilities negatively (Spekman and Sawhney, 1990).

In a dynamic environment, managers may suffer from response uncertainty in that they lack knowledge of the response options available to them (Milliken, 1987). This can lead them to imitate or copy the strategic response of their competitors as they assume that rival airlines have figured out what the appropriate response to the changing environment is (diMaggio and Powell, 1983). This can explain the proliferation of airline alliances, some of which are lacking in a clear rationale and strategic objective.

5.4.3 Airline privatisation

The withdrawal of governments from airline ownership is a recent trend which is gathering momentum in the industry. This is obvious in Figure 5.4 which depicts the change in the average government stake in airlines in different world regions.

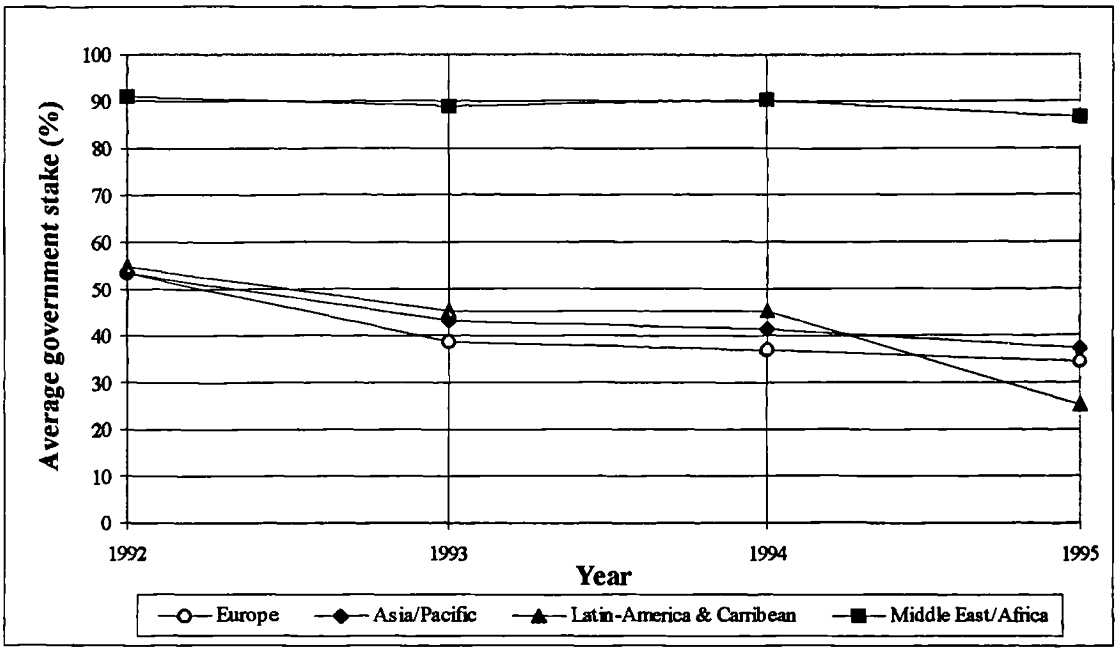


Figure 5.4 Change in the average government stake in airlines
Data extracted from the Airline Business, various issues

There are a number of airlines in various parts of the world that have already gone public or in which state ownership is being gradually reduced, examples being British Airways, Lufthansa and Alitalia in Europe, AeroPeru and Mexicana in Latin America, Japan Airlines, Singapore Airlines and Air New Zealand in the Asian/Pacific region and Kenya Airways in Africa.

What brought about the recent wave of airline privatisation? One reason could be that governments are wary of injecting large amounts of capital in such a capital-intensive industry, and therefore try to escape the responsibility of supporting the state airline (Wheatcroft, 1990). Furthermore, airlines still under state ownership are renown to be inefficient and non-commercially oriented, and are usually ridden by heavy debts. On the other hand, private airlines are more efficient and can react better in a deregulated environment (Prodromidis and Frangos, 1995). Iberia, Olympic Airways and Air

France are notable examples of state-owned airlines in Europe which are experiencing serious financial problems. This state of affairs is attributed mostly to extensive government interference leading to conflicting management objectives and also to the assurance that financial losses will be eliminated by government subsidies. Once privatised, airlines will become more accountable to non-government shareholders. Managerial and operational efficiency will then become important as the airlines are constantly pressured to produce profits. Other advantages of privatisation are the immediate broadening of the shareholder base and the greater freedom enjoyed by the airline to raise capital to buy aircraft (Beng, 1989).

5.4.4 Globalisation of air transport

Globalisation is defined by Landreth (1992) as a firm's ability to take advantage of global markets. The globalisation of the air transport industry is a recent development which Gialloretto (1988) and Kasper (1988) consider to be a natural outcome of the development of carriers because of the saturation of domestic markets. Indeed, airlines are currently experiencing great difficulty in growing domestically and are naturally turning to the international markets to partake in the major international traffic flows for growth, namely the transatlantic market, the Pacific market, the intra-Asian market, the Asia-Europe market and the intra-European market (Coombs, 1993). The imperative to become global is particularly serious in the case of US airlines which, according to Gialloretto (1988, p. 172) '....turned their minds to international expansion with a vengeance...' This is evident in Figure 5.5 which shows how the proportion of international traffic of American and United has increased over fifteen years.

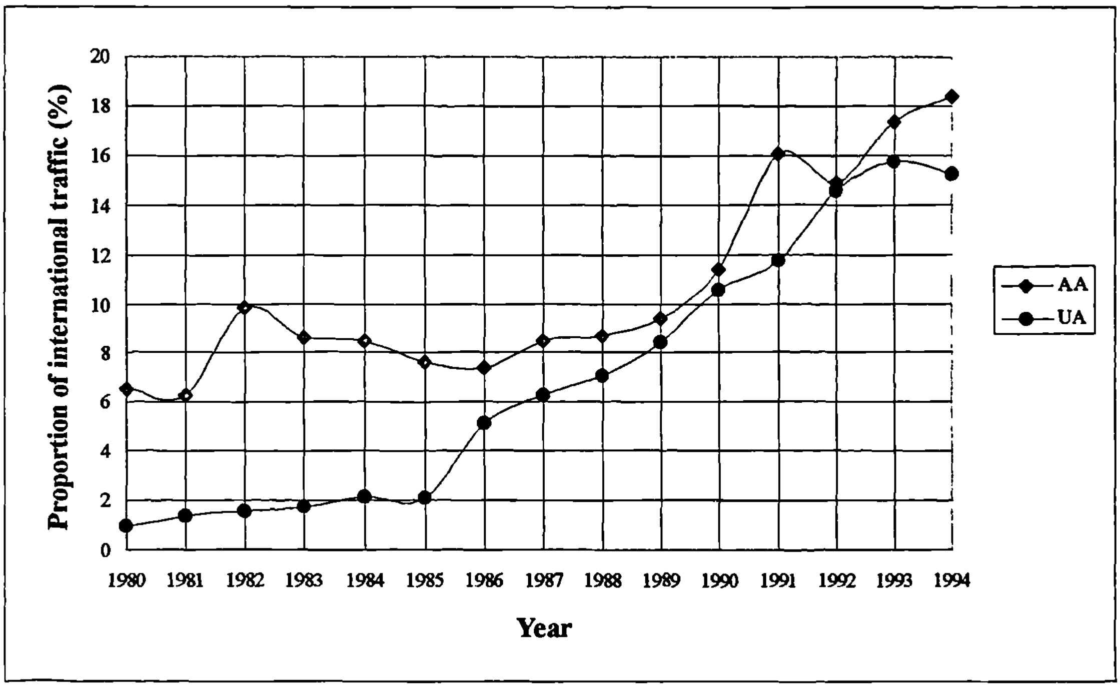


Figure 5.5 International growth of American and United
Data extracted from IATA World Air Transport Statistics, 1980-1994

To tap into international markets requires Fifth and Sixth Freedom rights which are not easy to obtain. Alliancing enables carriers to bypass the time-consuming negotiations and gain access to the routes which will form part of their global network. Another impediment to global operations is the formation of economic and political blocks in various parts of the world: the EU, the North American Free Trade Agreement (NAFTA), the Andean Pact in Latin America, ASEAN in Asia and the African Civil Aviation Commission (AFCAC) in Africa. Forseen consolidation of airlines in those blocks, the eventual right of airlines of member states to establish services between any points within the single market thus created, the possibility of the central negotiation of air service agreements on behalf of all member states and interline preference all give the perception that the blocks will eventually evolve to air transport fortresses. Benefits can be captured by operating in such markets. Access to them can be achieved by alliances with airlines within the blocks.

5.4.5 Increased competition

The above discussion has shown how deregulation and liberalisation, globalisation and airline privatisation have lead to a more competitive environment. Alliances constitute one of the tools which airlines have used to cope with the stepped-up level of competition they started experiencing. Indeed airlines had to improve the product they offered to their customers while simultaneously minimising the cost of doing so. The improved product consists mainly of a better choice of destinations offered to the consumer, higher service frequencies and better scheduling. Alliances offer them the ability to achieve that goal at low costs since it is the existing network assets of the partner which are drawn upon. Thus, alliances are very convenient for airlines to improve their competitiveness substantially at minimum costs and in a relatively short time.

Another advantage of alliances is that they automatically decrease the level of competition in markets where the partner was previously a serious competitor. An example is the Lufthansa-United alliance which was scrutinised by regulatory bodies because the airlines competed extensively on the North Atlantic. Furthermore, a major airline can control the level of competition on its home turf by allying with with the domestic airlines. This will prevent entry by competitors via the purchase of controlling equity stakes in the domestic airlines.

5.4.6 World-wide economic changes

The transformation of the world-wide economic landscape is also a crucial factor which has lead airlines to seek for partners. According to IATA, the global economic recession which has hit particularly the US and Europe at the beginning of this decade has caused airlines to lose more than $14 billion dollars on international operations from 1990 to 1993 (Oliver, 1994). The financial bleeding of airlines was worsened in that period by the Gulf War in 1991 which caused fuel prices to soar (see Figure 5.6) and passenger traffic to drop.

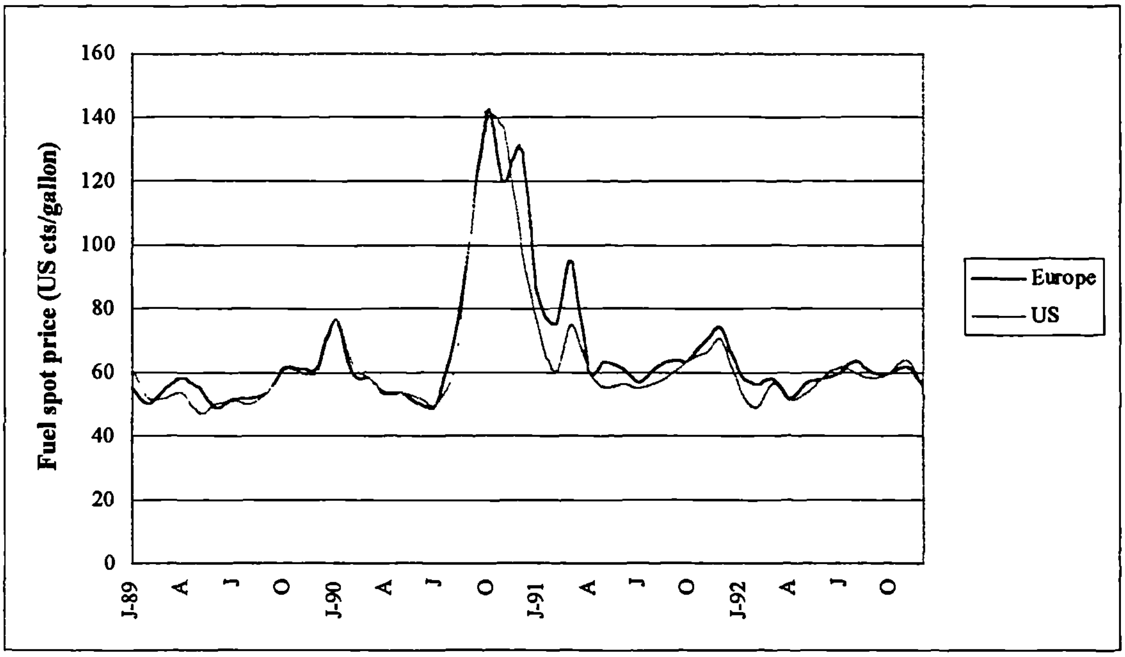


Figure 5.6 Variation of fuel price over the period 1989 to 1992
Data extracted from Airline Business, various issues

As a result, airlines have been under serious pressure to reduce their costs. Alliancing constitutes an effective means to do so because the partner airlines can share their costs and avoid duplication of assets. Alliances also enable airlines to benefit from traffic feed which then leads to a higher traffic density on their network. This results in a decrease in their unit costs.

5.4.7 Regulatory barriers

Having analysed all the forces which have induced airlines to co-operate, the question arises as to why airlines have selected the alliance strategy to improve their competitive position instead of making use of mergers and acquisitions as in other industries. The answer to this question lies in the current regulatory and nationalist barriers which render the merger strategy difficult, if not impossible, to adopt.

5.4.7.1 Competition issues

Promotion of competition between airlines is important in the airline industry because it leads to lower fares and improved service. Mergers are generally considered as anti-competitive because they decrease the level of competition in many markets. This was observed particularly in the US following the 'merger-mania' which occurred in the mid-1980s. Fares went up, especially when the merged entity extended its control over hubs at both ends of the markets (Mauldin, 1989) and service levels deteriorated. For that reason, airline mergers are generally frowned upon and have to clear a number of regulatory hurdles before gaining approval.

In the EU, mergers are subject to the EC Merger Control Regulation which investigates their potential effect on market concentration. If the merger involves two carriers of the same country, then it has to be cleared by the national monopolies and merger commission first. Furthermore, even though the proposed merger falls within the provisions of the Merger Control Regulation, it can still be challenged in national courts on the basis of Article 86[34] of the Treaty of Rome. This Article applies to check the abuse of market power where it is enjoyed by the combined entity in a dominant position. Since most of the intra-EU routes are either monopolies or duopolies, then any merger is very likely to result in a dominant position which can then be scrutinised under Article 86. The US counterparts of the EU regulations are the antitrust regulations embodied in the Sherman and Clayton Acts[35]. These rules also scrutinise mergers to detect whether they restrict competition.

5.4.7.2 National regulations

Most governments tend to have an aversion for the loss of the national identity of their airlines. Therefore, apart from the rules designed to maintain competition in markets, other regulations exist to preserve the national identity of carriers.

In the US, regulations restrict the purchase of shares by foreign interests in US carriers to a maximum (25% in most cases). The key point here is control. The US Government takes the view that foreign interests should be permitted 49% of the stock in a US airline or 25% of the voting stock because, with the rest of the stock being widely distributed among institutional and private investors, a holding of more than

[34] See footnote 24.
[35] See footnote 25.

25% would imply control. Therefore, it is not possible for a foreign carrier to acquire a majority interest in, let alone take over, a US airline even though it is a private company. Currently, the US Government is debating whether to allow the limit on the voting stock to be risen to 49%.

In Europe, a similar situation prevailed before 1993 when the the Third Liberalisation Package had not yet come in force. The Third Package effectively replaced the concept of national ownership and control by that of Community ownership meaning that EU airlines are now required to be majority owned by nationals of Member States instead of being locally owned. Therefore, EU airlines can merge with airlines of other EU States provided they satisfy the competition conditions outlined above. However, as Balfour (1995) notes, the new regulation has not lead to a spate of mergers as in the US, though equity stakes among EU airlines are increasing gradually. British Airways, for example, has acquired 49% of TAT with the option of increasing its stake to 100% in 1997. Restrictions on the ownership and control structure of EU airlines with respect to non-EU interests still remain in place, and vary depending on the policy of the EU States.

Mergers between US and European airlines with Asian and African carriers are practically impossible because most of these carriers are majority owned by their governments. The nationalist tendency is also very strong in these regions and airlines are viewed as a symbol of national virility which positions the country in the international arena. Governments will therefore strongly resist mergers and acquisitions, and will consider alliances more acceptable. The nationalist sentiment in Asia is best exemplified by the following statement from a Korean Airlines official: 'Our airline industry is a national strategic business and a matter of national pride. We cannot consider mergers with others.' (Knibb, 1994; p. 40).

5.4.7.3 International regulations

Once a proposed airline merger has cleared all these national and regional hurdles and proved that it will not affect competition negatively, it has to confront a major international regulation: the bilateral agreement. These agreements, known as bilaterals, define the type and level of airline operation between the two countries which are signatories to the agreement.

One of the main barriers to airline mergers is the 'substantial ownership and control' clause present in all existing bilateral agreements, a version of which states that '....each contracting party reserves the right to withhold, revoke, or suspend, or impose such conditions as it may deem necessary with respect to the operating permission of the designated airline, in any case *where it is not satisfied that substantial ownership and effective control of that airline are vested in nationals of the other contracting party*' (Fenema, 1992, p. 27, emphasis added). 'Substantial' has usually been quantified in domestic regulations as more than 50%. Thus, following from the bilateral agreement, it can be difficult for a state to negotiate for access to other countries if its citizens do not own more than 50% of its airline. This negates the possibility of a foreign carrier, or any other interest, of acquiring the airline wholly.

5.5 Conclusion

This chapter has shown that of the two theories developed to explain the need for inter-firm collaboration, Ohmae's globalisation theory lends itself better to the airline industry. However, that theory is geared mainly towards non-service industries and therefore explains the proliferation of airline alliances only partially. Indeed, other factors have prompted airlines to adopt the co-operative strategy. The recognition of the existence of other forces has lead to the formulation of an alternative model of airline alliance formation.

Having identified the forces driving airline alliance formation and incorporated them into a conceptual model, it would be useful to ask whether airline alliances will continue to exist in the future, or whether they are mere transitional organisational forms which will either dissolve into their constituents or evolve into single entities tied even more tightly together. For the time being, it is difficult to imagine the airline industry moving away from the trend of allying. Indeed, it does seem that airlines have recognised that alliances enable them to achieve some kind of a global reach in less time and at much lower costs than if the growth were organic. Furthermore, the regulatory restrictions which have constrained airlines towards alliances are not near to disappear. Therefore, the trend towards airline co-operation is here to stay. However, airlines appear to lack expertise in managing their alliances for the number of alliance casualties is quite substantial. This lack of experience can be attributed to the newness of the alliance strategy to airline managers. Therefore, there will be more break-ups in the future followed by recombinations. This state of flux will gradually yield a stable environment as airlines settle with their 'right' partners.

Whether these combined structures will go one step further towards mergers is another question. Regulatory and nationalist barriers to airline mergers are still very strong and commonly work alongside political wrangling. Furthermore, even though ownership regulations within a region can be relaxed (as in the case of Europe), regulations allowing foreign ownership from outside that region still remain very restrictive. For example, it is very difficult for an European or Asian carrier to purchase a stake of more than 25% in a US carrier. Bilateral agreements, which are being widely claimed as outdated but which show no signs of being replaced, will also act as effective barriers to mergers. Furthermore, nationalist barriers to mergers remain very strong in Asia and especially Africa and are not expected to fall in the near future. Governments in those regions still retain high ownership and control over their airlines. Therefore, it is predicted that the airline industry will evolve to a state where there will be domination by a number of groupings constituted of distinct airlines co-operating closely together.

6. AIRLINE COLLABORATIVE STRATEGIES

Introduction

Signing the agreement to form an alliance is only the first step. Following that, strategies have to be implemented at the operational level to make the alliance work and eventually bring benefits to the partners. The aim of this chapter is to identify the collaborative strategies which airlines have devised and to examine how these tools can increase the competitiveness of those airlines. It is divided into two main parts. In the first part, the methods by which alliances increase the traffic flows on the airlines' individual networks are looked into. Particular attention is paid to code-sharing and block-spacing as they constitute the backbone of all existing strategic airline alliances and of most tactical ones. The second part of this chapter is devoted to the methods of reducing production costs via airline alliances. Sectors of production which are combined together are identified and how lower unit costs and higher productivity are achieved is discussed.

6.1 Market-Related Alliance Strategies

Market-related alliance tools are those which are designed to increase the attractiveness of the partner airlines in the eyes of consumers and to increase their market power. Their application is meant to increase market share, traffic density and load factors, and eventually lower unit costs as costs of production are spread over a larger amount of traffic. Increases in market power can allow the airlines to raise fares without losing much traffic, and hence increase their revenues. The marketing tools are identified as code-sharing, block-spacing, franchising, schedule, fare and service co-ordination and FFP combination.

6.1.1 Code-sharing

Code-sharing is a central element of most current airline alliances. The US DoT defines code-sharing as 'a common airline industry marketing practice where, by mutual agreement between co-operating carriers, at least one of the airline designator codes used on a flight is different from that of the airline operating the flight' (Shenton, 1994a, p. 13). In other words, code-sharing is the practice whereby two airlines willingly[36] share the same IATA two-letter code, as presented on published schedules, CRSs and tickets, on the same flight. An example of code-sharing is given in Figure 6.1 taken from the *ABC World Airways Guide* of September 1995.

Amsterdam-Minneapolis	*NW8665*♦
Minneapolis-San Diego	*NW195*

Figure 6.1 Code-sharing example
Source: ABC Guide, September 1995

What this extract wants to convey is that both the Amsterdam-Minneapolis and Minneapolis-San Diego flight portions are operated by Northwest Airlines, hence the connection is on-line. However, flight NW8665 is in fact operated by KLM with its own aircraft and crews. The sign '♦' is there to give an indication that the flight is code-shared.

Code-sharing is not a new concept to the airline industry. Indeed, it has been around for nearly thirty years. However, its current use is much more extensive and aggressive in nature. The next sections will explore the development of code-sharing since it was invented.

[36] It is important to distinguish code-sharing from 'controlled duplication' whereby two airlines are assigned the same designator code for the simple reason that the alphabet is limited and the number of airlines exceeds the number of designator codes available. Controlled duplication is practised only where the two airlines do not serve the same markets.

6.1.2 Development of code-sharing

6.1.2.1 Code-sharing between US airlines

The origins of code-sharing can be traced as far back as 1967 when Allegheny Airlines (the former USAir) withdrew from low-density markets and allowed independent commuter carriers to operate them. The withdrawal came as a result of the planned move of Allegheny Airlines to jet aircraft which could not be economically operated in those markets. To avoid losing its presence in those markets, Allegheny Airlines ensured that the independent commuters used its designator code on the segments which they operated. In spite of its success, the practice started proliferating throughout the US only after 1984. This lateness can be attributed to the introduction of CRSs and the full development of hub-and-spoke networks in the US which occurred at around that time. Table 3.1 lists the current code-sharing agreements between US majors and commuters.

6.1.2.2 Code-sharing between US and foreign airlines

In the late 1980s, the concept of code-sharing began exporting itself into the international arena. The prime motive for foreign airlines to code-share with US airlines was to enable them to exploit their traffic rights to beyond-gateway cities which had up to then been left unused or abandoned owing to the low traffic density of those markets (Shenton, 1994a). An example is the code-sharing agreement between Qantas and American Airlines whereby Qantas passengers from Sydney bound to San Francisco were accommodated on a connecting American Airlines flight to San Francisco at New York. That was in spite of the fact that Qantas possessed the traffic rights from New York to San Francisco. The New York-San Francisco flights were identified under both American Airlines' and Qantas' designator codes. As of October 1988, the US DoT had approved 17 such agreements (see Table 6.1).

As from 1989, the rationale for code-sharing shifted from the exploitation of unused traffic rights to the securing of traffic feed and the access of markets. Airlines wanted to be able to code-share on routes where they did not already have the right to fly.

US carrier	Non-US carrier	Code-sharing route
American	Qantas	New York/Los Angeles/San Francisco-Australia
Braniff	Florida Express	Orlando/Ft. Lauderdale-Nassau
Continental	Britt Airways	Cleveland-London, Ontario, Canada
United	British Airways	Chicago/Seattle-London
Continental	Transavia	US-London-Amsterdam
Ontario Express	Canadian	Pittsburgh-Toronto/Hamilton, Canada
Pan Am	Malev	New York-Frankfurt-Budapest
TWA	Gulf Air	New York-London, UK-Gulf States
Eastern	LIAT	San Juan-Caribbean
TWA	Malev	New York-Zurich-Budapest
Continental	Canadian	Dallas Fort Worth/Houston-Calgary/Edmonton, Canada
United	British Airways	Washington/Chicago/Denver-London, UK
USAir	Chautauqua	Pittsburgh-Hamilton, Ontario, Canada
Eastern	Bar Harbor	Boston-St. Johns, Halifax, Canada
TWA	Austrian	New York-Frankfurt-Zurich, Vienna
Air Ontario	Air Canada	Syracuse/Albany-Toronto, Detroit-London, Ontario, Canada

Table 6.1 Code-sharing agreements between US and non-US airlines (Oct. 1988)
Source: Air Transport World, December 1988, p. 81

In 1989, BA and United sealed a major code-share agreement which effectively allowed them to act as 'the ultimate global airbridge' (Feldman, 1989; p. 97). Though the alliance was eventually dissolved, it was greatly imitated by other carriers. Consequently, the number of US-foreign route agreements increased steadily since then to reach 61 in 1994 (GAO, 1995). Figure 6.2 shows the yearly progression in the number of code-shared agreements between US and foreign airlines since 1989.

The shift in the rationale for code-sharing has increased its strategic importance to such an extent that code-sharing has been used in the bilateral negotiations between the UK and the US in 1991. In exchange for the replacement of TWA and Pan Am by American Airlines and United Airlines as the only US carriers allowed to fly to Heathrow, BA was permitted access to beyond-gateway points via code-sharing with a US partner. Hardened opponents of code-sharing such as American Airlines have reluctantly yielded to the pressure of code-sharing and are seeking code-share partners to extend their global network (Jennings, 1995b), hence the recent alliance with BA.

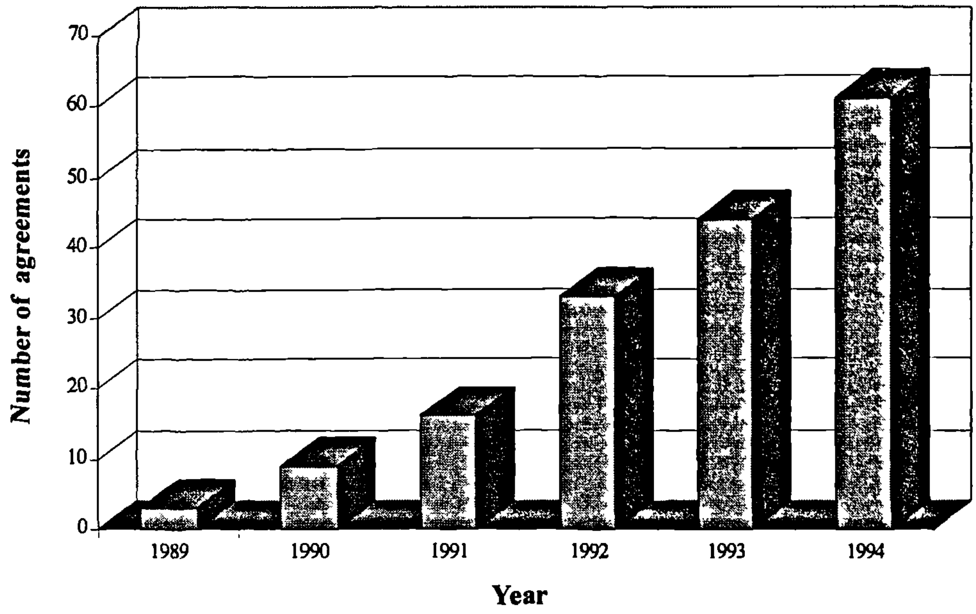


Figure 6.2 Number of US-foreign code-sharing agreements
Source: US GAO (1995)

6.1.2.3 Code-sharing agreements of European airlines

Prior to the First Liberalisation Package (1985), code-sharing within Europe was virtually non-existent. The phenomenon started picking up mid-point in the liberalisation process (1990), at which time four European airlines–KLM, Lufthansa, SAS and Swissair–had created 20 code-sharing alliances (see Figure 6.3). Twelve of those alliances were with European airlines and the rest were with airlines in other regions of the world. After the adoption of the Third Package, the number of code-sharing alliances increased dramatically to 71 in 1995. Forty five of those alliances are intra-Europe while the rest is mostly with US carriers (see Figure 6.4). BA, Iberia, KLM, Lufthansa, Swissair and British Midland lead the way in making use of the code-sharing tool.

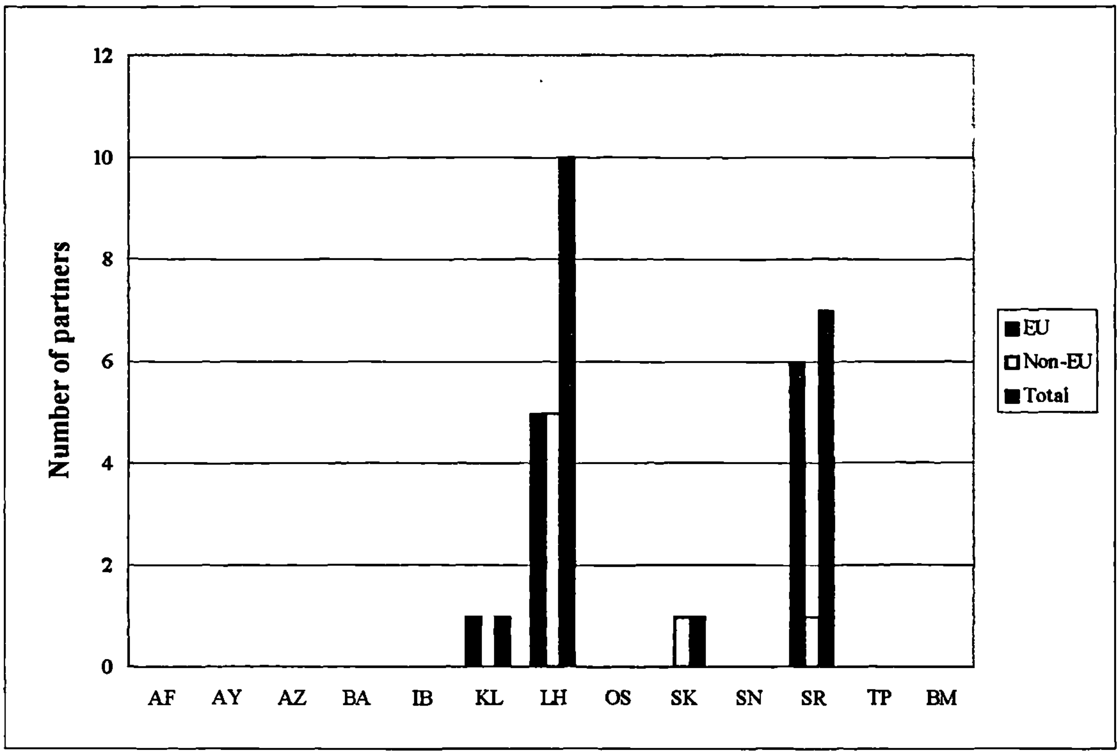


Figure 6.3 Number of code-sharing partners of selected European airlines in 1990
Source: ABC World Airways Guide, June 1990

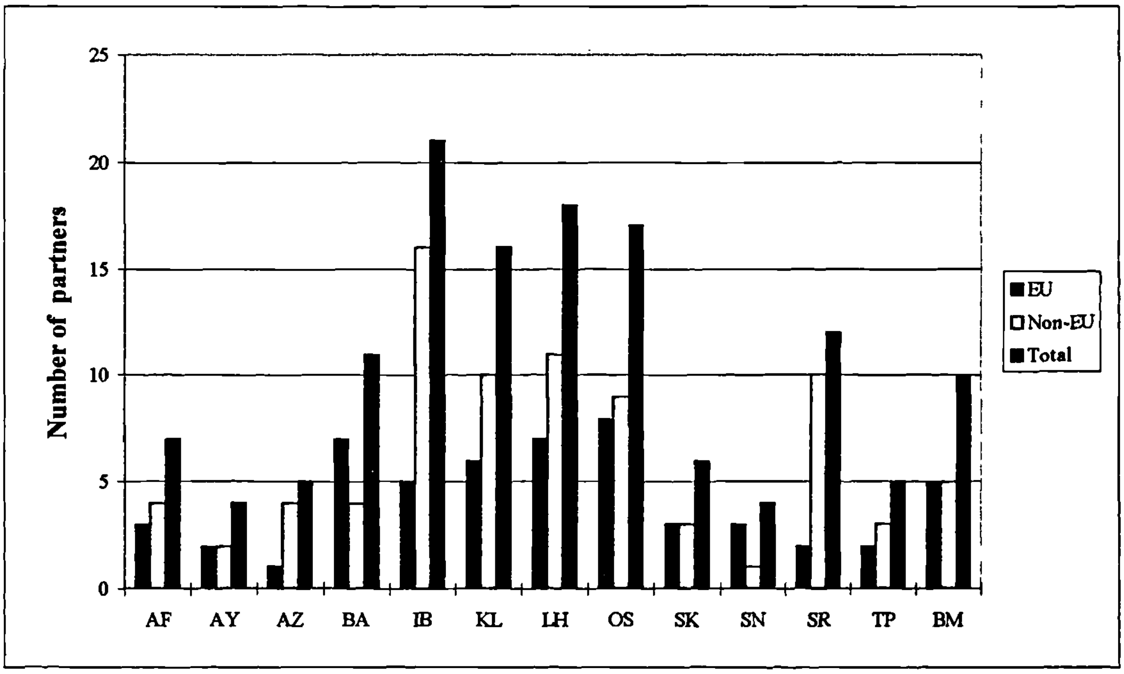


Figure 6.4 Number of code-sharing partners of selected European airlines in 1995
Source: Airline Business, June 1995, ABC World Airways Guide, June 1995

Since the Third Package was the most liberal of all three liberalisation Packages, one can conclude that it was partly responsible for the code-sharing spree which occurred after 1993. The effect of European liberalisation is even more dramatic if the number of code-shared intra-European routes is considered. Figure 6.5 gives the number of such routes two years before and after the Third Package. In 1990, there were a total number of 32 intra-European code-shared routes; this number had risen to 203 in 1995.

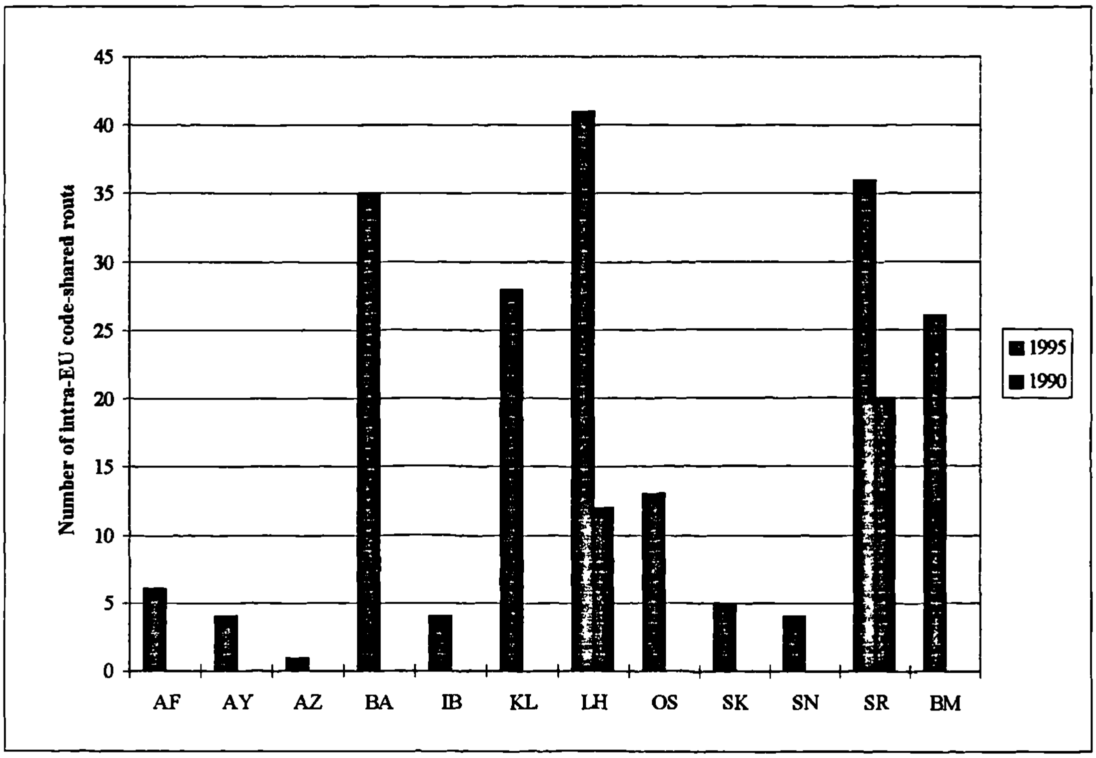


Figure 6.5 Number of intra-Europe code-shared routes
Source: ABC World Airways Guide, June 1990 and June 1995

The Third Liberalisation Package can also be held responsible for the surge in code-sharing agreements between European major and regional/domestic airlines. From Figure 6.6, one can observe that the number of such alliances increased at a very slow rate from 1988 to 1992. However, from 1993 to 1996, the number increased threefold.

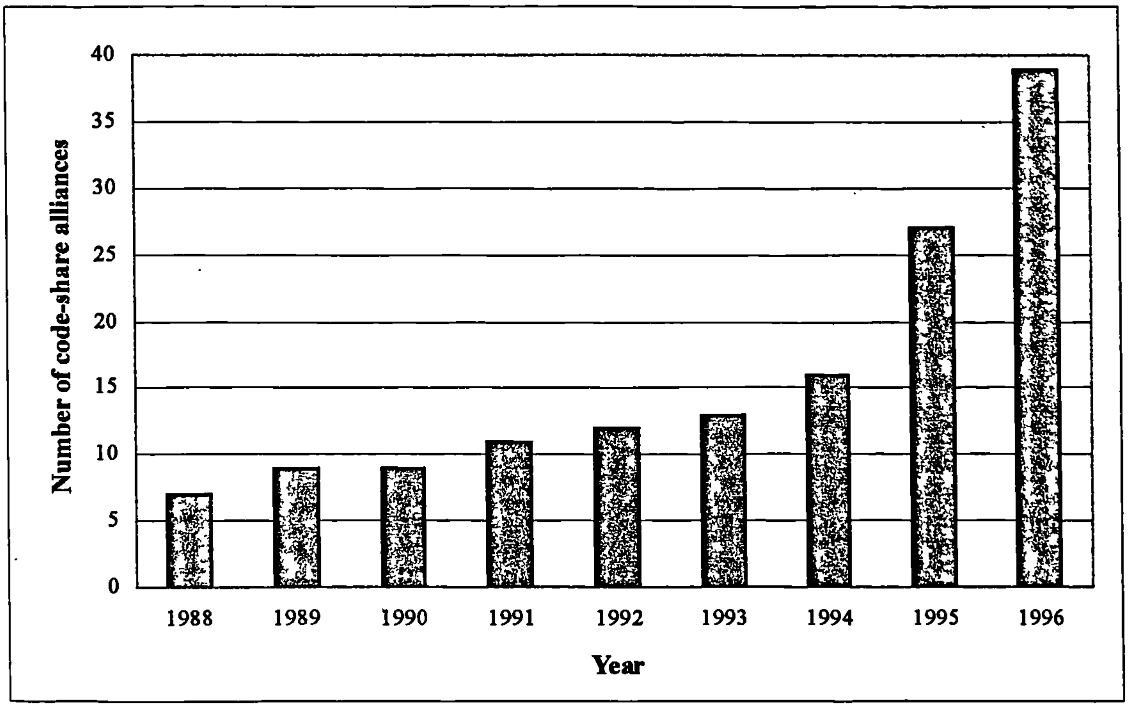


Figure 6.6 Evolution in the number of code-share alliances between European major and regional/domestic airlines
Source: ABC World Airways Guide

6.1.3 Types of code-sharing alliances

Airlines make use of code-sharing to various degrees of involvement. Based on the strategic scope of code-sharing, the US GAO (1995) differentiates between three types of code-sharing alliances: strategic, regional and point-specific. These can be either gateway-to-gateway code-sharing (for example, between Frankfurt and Chicago in the case of the Lufthansa-United alliance) or behind-gateway code-sharing (for example, between Charlotte and Charleston for the BA-USAir alliance). The different types of code-sharing are analysed next.

6.1.3.1 Strategic code-sharing alliances

In strategic alliances, code-sharing is practised on a large number of routes with the aim of linking the participating airlines' flight networks strategically. Only three existing airline alliances effectively fall into this category: BA-USAir, KLM-Northwest and Lufthansa-United Airlines. The details of the code-sharing agreements of these three alliances are presented below. One will observe that the alliances involve both gateway-to-gateway and behind-gateway code-sharing.

Following the agreement sealed in 1993, BA places its designator code on USAir's flights from 7 connecting points to 52 cities within the US. USAir, however, does not code-share on BA flights from London because this is not allowed in the US-UK bilateral agreement. Furthermore, USAir has not requested the permission to do so. The transatlantic routes are operated by BA using aircraft wet-leased from USAir. The details of the agreement are shown in Figure 6.7.

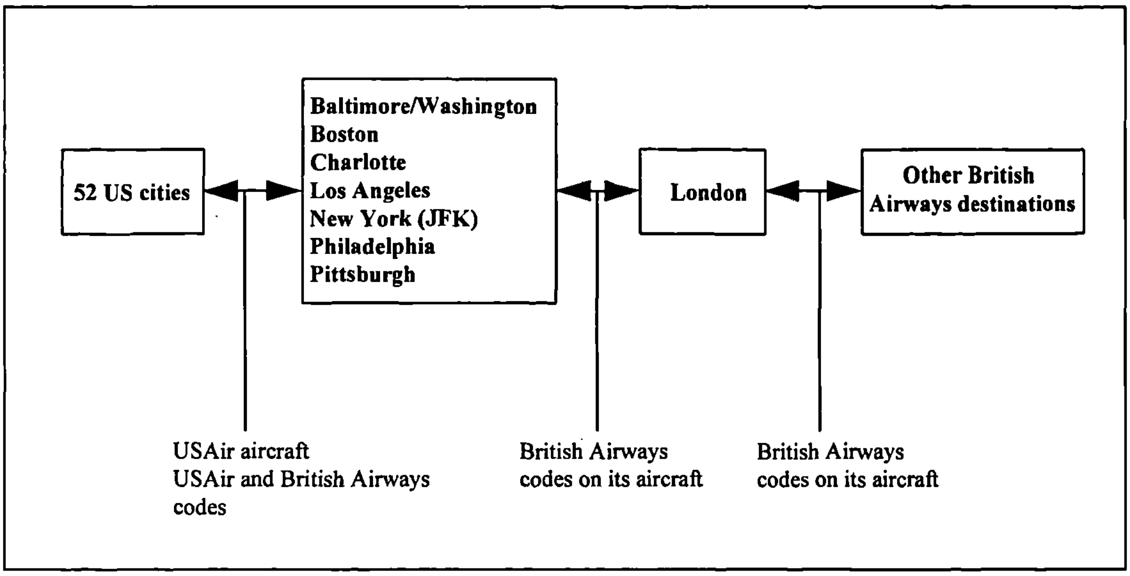


Figure 6.7 British Airways-USAir code-sharing network as of December 1994
Source: GAO (1995)

The KLM-Northwest and Lufthansa-United code-sharing alliances differ from the BA-USAir one in that both airlines in the partnerships code-share on each other's routes. KLM code-shares with Northwest on flights from Minneapolis, Boston and Detroit to 88 US cities as well as on eight KLM gateway cities in the US. The transatlantic flights are operated by both KLM and Northwest. Conversely, KLM flights from Amsterdam to 30 European and Middle Eastern cities carry the Northwest designator code (see Figure 6.8). The Lufthansa-United code-sharing network is shown in Figure 6.9. Lufthansa has access to 25 US cities flown by United from Washington/Dulles and Chicago while United code-shares with Lufthansa on flights from Frankfurt to 30 European and Middle Eastern cities. United aircraft are used to fly the inter-hub routes. In addition, United code-shares on Lufthansa's flights between Frankfurt and Lufthansa's 10 US gateways and Lufthansa code-shares on United flights between its 10 US gateways and the 25 interior cities.

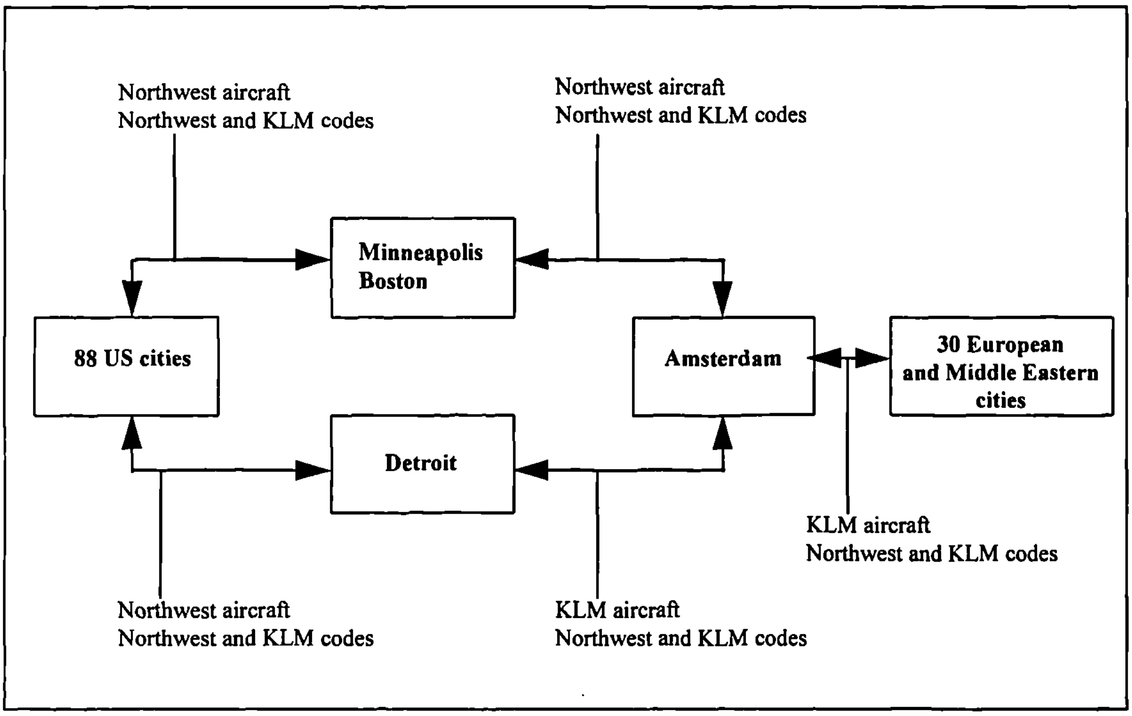


Figure 6.8 KLM-Northwest code-sharing network as of December 1994
Source: GAO (1995)

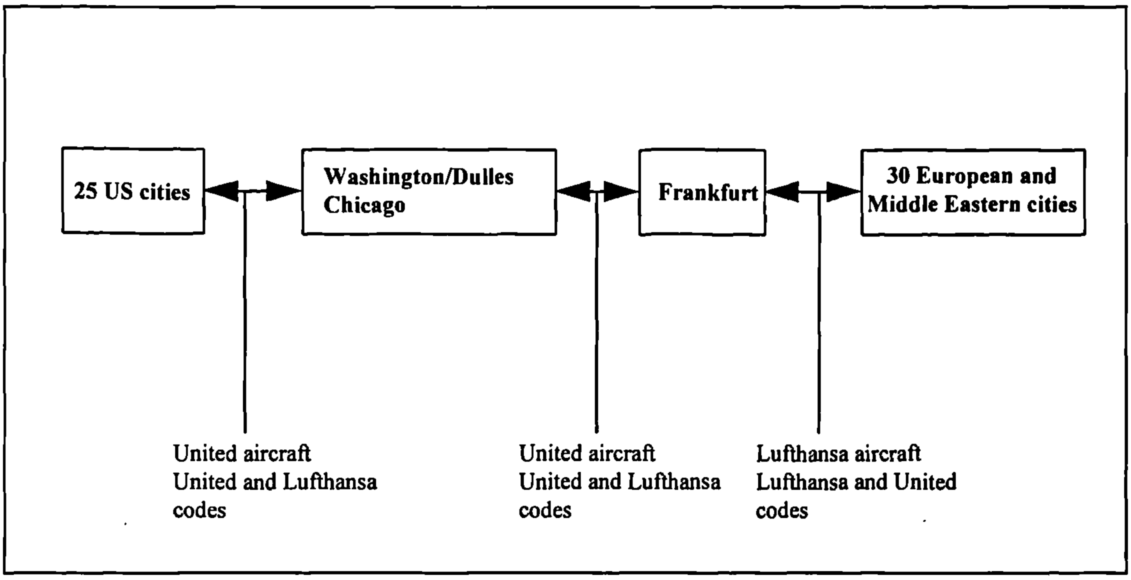


Figure 6.9 Lufthansa-United code-share network as of December 1994
Source: GAO (1995) and Lufthansa data

6.1.3.2 Regional code-sharing alliances

In this type of alliance, airlines share their codes on a large number of routes to and from a specific region. United Airlines is quite advanced in that type of co-operation and has secured a substantial number of code-sharing agreements with airlines throughout the world to allow it to benefit from traffic feed. The regional code-share alliances of United Airlines are given in Table 6.2.

Partner airline	Country	Number of code-shared routes
Lufthansa	Germany	11
Aeromar	Mexico	10
Air Canada	Canada	6
ALM Antillean	Caribbean	4
Aloha	Hawaii	4
Ansett Australia	Australia	7
British Midland	UK and Europe	8
Gulfstream International	Florida and Bahamas	12

Table 6.2 Regional code-share alliances of United Airlines
Source: Murphy (1995)

Other examples of regional code-sharing alliances include American Airlines with British Midland and Gulf Air, and Continental Airlines with Alitalia.

6.1.3.3 Point-specific code-sharing alliances

A code-sharing alliance which applies on flights between only a small number of points is termed a point-specific alliance. The GAO does not specify explicitly how small the number of points has to be for an alliance to qualify as point-specific. However, it does seem that the number has to be at least less than three. Out of the 61 code-sharing alliances between US and foreign airlines, the GAO found the majority (50) to be point-specific. Most code-sharing alliances world-wide also tend to be point-specific (Gallagher, 1994), the reason being that regulatory approval has to be obtained for beyond-gateway code-sharing.

6.1.4 Block-spacing

Block-spacing is a concept which is parallel to code-sharing and is often confused with it. Under a block-spaced agreement, an airline purchases a number of seats on another carrier's flight and markets those flights as though they were its own. Block-spacing is therefore akin to some kind of partial wet-lease, whereas code sharing is more of an improved version of interlining (de Groot, 1994). An example of a block-spacing agreement is the one between Virgin Atlantic and Delta Airlines whereby Delta Airlines purchases seats on Virgin's flights between Newark, New York, San Francisco, Los Angeles and London/Heathrow and between Boston, Orlando, Miami and London/Gatwick. As of June 1995, there were a total number of 51 block-spacing agreements world-wide. Figure 6.10 shows the breakdown of the number of block-space agreements by region. European and Asian airlines are way ahead airlines in other world regions in the use of block-spacing agreements; taken together, they account for nearly 69% of all block-space alliances.

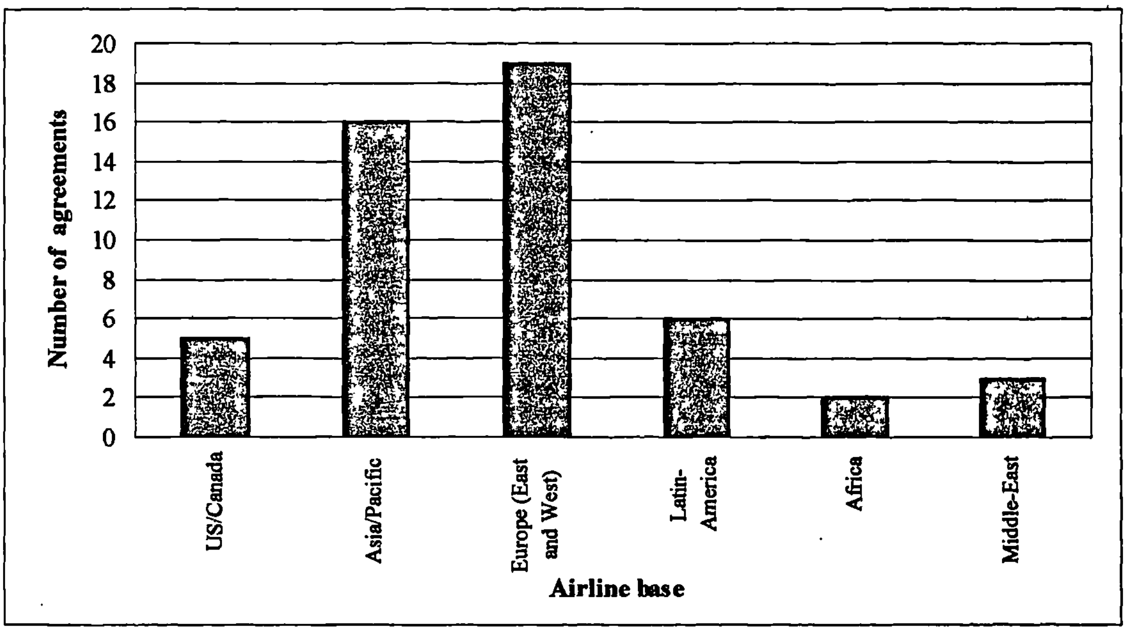


Figure 6.10 Breakdown of airline block-space agreements by region (1995)
Source: Airline Business, June 1995

6.1.5 Benefits of code-sharing and block-spacing

Most airline alliances are built upon code-sharing and block-spacing because these tools confer a number of marketing benefits, the most important ones being economical access to new markets, traffic feed, capacity containment and better CRS position.

6.1.5.1 Economical access to new markets

Code-sharing and block-spacing are being increasingly used to allow airlines access to new markets and to benefit from traffic feed. For example, BA is able to gain access to 52 US cities to which it does not have the right to fly via its code-sharing alliance with USAir. By placing its code on USAir's flights to those destinations, BA can effectively market those flights as if they were its own. In that way, a flight from London to, say, Syracuse via Philadelphia is promoted from interline to on-line status[37]. This is advantageous since consumers are known to prefer on-line to interline connections[38]. Promotion of interline connections to on-line connections allows the airlines to keep traffic on the combined system and to benefit from traffic feed. Code-sharing also helps BA to sell the long-haul portion of the service. In addition, BA does not have to invest the enormous amounts of capital and time in trying to develop and operate the routes itself.

6.1.5.2 Traffic feed

Traffic feed is the main rationale behind the formation of major-regional/domestic alliances. This is particularly the case in the US where commuter airlines feed their major partners at their hubs. To a certain extent, this is also true in Europe where, following liberalisation, airlines have allied with domestic airlines in other European countries in order to access the markets of their competitors. This has lead to a

[37] Hence, Sorensen (1995) describes code-sharing as 'super-interlining'.
[38] Studies performed by the US DoT have shown that consumers prefer on-line to interline connections because they believe that same carrier connections leave from closely-positioned terminal gates so that the walking distance is short. In addition, they believe that there is less risk of baggage loss in on-line connections.

reaction whereby European majors have taken large stakes in their domestic airlines to pre-empt competition in their domestic markets.

Traffic feed is also occurring in the international arena. Taking the BA-USAir example, placing the BA code on intra-US routes increases the amount of traffic transferring to the Europe-bound BA flights at the US gateways.

6.1.5.3 Capacity containment

Code-sharing and block-spacing also allow airlines to contain capacity in thin markets which can not support two or more competitors. The airline which moves out of the market can still maintain its presence there by placing its code on its partner's flight or on part of its seats. Airlines can make use of code-sharing in this way to avoid the duplication of flights. For example, Swissair and Austrian Airlines code-share on the Zurich-Vienna route. Only one aircraft is flown at a higher load factor rather than two aircraft at lower load factors. Operating costs are thus reduced though the airlines still have access to the revenue.

6.1.5.4 Better CRS position

The practice of code-sharing is closely linked to CRSs. Owing to the order of CRS display which gives precedence of on-line connections over interline connections, code-shared flights are promoted to better screen positions. Since travel agents have a greater likelihood of booking a flight on the first CRS screen, code-shared flights stand a greater chance of being selected than an interline connection. This is in spite of the fact that some interline connections can be better than the code-shared flights in terms of travel distance and waiting time at the connecting airport. As was pointed out in Chapter 4, some airlines use code-sharing to clutter the CRS screens by using double and triple listings. Consequently, competitors' flights are pushed to less favourable CRS screens.

6.1.6 Franchising

Franchising is an even closer type of co-operation than code-sharing in that the operating airline shares the whole brand of the franchisor rather than its code only. Under the franchising agreement, the franchisee is allowed to operate its services using the franchisor's flight prefix (code-sharing), and to adopt its livery, cabin interior decor, and cabin crew uniforms, in exchange for a fee. Under the agreement, the franchisee can usually pay for a number of services provided by the franchisor. These services include reservations, ticketing, inventory control, revenue accounting, sales, ground handling and catering (Endres, 1995; Bathgate, 1995). The franchising strategy has its origins in the US when commuter airlines allied to US majors were brought under one brand such as American Eagle, The Delta Connection and Northwest Airlink.

Following the adoption of the Third Liberalisation Package, franchising has been actively pursued in Europe by two UK carriers, namely BA and Virgin Atlantic, with the former being by far the more active of the two. The BA franchises are given in Table 6.3.

BA franchise	Base	Date operational
CityFlyer Express	UK	August 1993
Brymon	UK	August 1993
Maersk Air	UK	August 1993
Loganair	UK	July 1994
Manx Airlines-Europe	UK	January 1995
GB Airways	UK	February 1995
Sun-Air	Denmark	August 1996
Comair	South Africa	October 1996

Table 6.3 BA franchises (1996)
Source: various

Except for Maersk and GB Airways which operate as BA, the carriers are grouped under the brand name of BA Express. They have aircraft livery, on-board and ground personnel uniforms, and in-flight service which are similar to those of BA (Crumley, 1993). In addition to the airlines listed, TAT European Airways in France and DeutscheBA in Germany are also managed as franchises.

In the same way as US major airlines, BA strives to obtain control of its franchisees via equity holdings. In the words of Lewis Scard, BA's General Manager Franchising: '[British Airways] likes partnerships, but also likes to control [the franchisees]' (Endres, 1995; p. 16). Therefore, BA wholly owns Brymon and possesses holdings of 49.9% in TAT European Airways and of 49% in DeutscheBA and GB Airways. One could argue that the emphasis of BA on franchisee ownership and control is partly driven by the need to prevent competitors from the European continent from accessing the British domestic market via alliances with UK's domestic/regional airlines.

The franchise alliances of Virgin Atlantic are less extensive than those of BA and do not involve equity holdings. The first one was sealed in March 1993 with the Greek carrier Southeast European Airlines (SEEA) which operated between London/Heathrow and Athens. The alliance has been terminated partly due to SEEA's financial problems. Virgin still has a franchising agreement with CityJet which operates between Dublin and London City airport.

6.1.7 Benefits of franchising

6.1.7.1 Benefits to the franchisor

The main benefit of franchising to the franchisor is low-risk and economical access to markets where it has a weak presence. That was the main rationale for the formation of franchises between major and commuter airlines in the US following deregulation when most US majors ceased operation in many thin markets owing to their unprofitability. In addition, the majors did not possess the appropriate small aircraft to operate in those markets economically. Therefore, in order to maintain a significant presence in the markets, they sealed franchising agreements with a number of commuter airlines which also provided them with feed at their main hubs.

Market presence and traffic feed are also the reasons underlying BA's franchising strategy. For example, Manx enables BA to be present in Wales in spite of the fact that it had abandoned Wales on economic grounds. Concerning feed, Manx links into BA's network at Manchester. BA also uses the franchising strategy to access new markets and to gain a foothold in its European competitors' markets. For example, GB Airways allows it access to the West Mediterranean (Gibraltar, Madeira, Tunisia and Morocco among others). TAT European Airways and DeutscheBA provide access to France and Germany and allow BA to compete indirectly with Air France/Air Inter and Lufthansa respectively.

A third benefit accruing to the franchisor comes in the fees paid by the franchisees, and in the money it receives for the services it renders to them. However, such financial elements are of minimal importance when compared to traffic feed, market presence and access for it is in the franchisor's interest to keep the franchisee's costs down. Only then will the franchisee be able to operate the thin domestic routes economically.

The situation could be different in Virgin Atlantic's case for its franchise with CityJet does not provide it with feed. This leads Mike Bathgate of Manx airlines to conclude that ' ....the rationale is for Virgin to see franchising as a profit opportunity in its own right-and nothing to do with feed' (Bathgate, 1995; p. 9).

6.1.7.2 Benefits to the franchisee

Based on Burgess (1995) and Bathgate (1995), the benefits accruing to the franchisee can be summarised as follows:

(1) Brand affiliation. Being affiliated to a major airline brings passenger credibility. This is especially important if the franchisee operates turboprop aircraft in which passengers are less enthusiastic to fly. According to Burgess (1995), the BA livery adopted by CityFlyer is reassuring to passengers who view it as a 'seal of approval'. This seems to have been proven by research (Endres, 1995).

(2) FFP affiliation. By being affiliated with the majors' FFPs, the franchisees can offer their passengers FFP benefits which a small independent airline would be unable to provide, such as lounge access and the ability to earn FFP points. This can bring in increased traffic as FFP points collected on the franchisee's flights can be used on the franchisor's extensive network. For example, Manx witnessed a high increase in its Executive Card holders when it allied with BA (Bathgate, 1995).

(3) Better marketing and distribution. The services provided to the franchisee enable it to access the franchisor's comprehensive world-wide marketing and distribution network. On its own, the franchisee would never have been able to achieve such global access owing to the tremendous costs involved.
(4) Improved bottom line. All these factors increase the traffic density on the franchisee's network/routes leading to increased revenues and lower unit costs.

To this list can be added the financial support available to the franchisee when the franchisor purchases a stake into it. This provides the franchisee with the financial ability to acquire aircraft and to put up with competition.

6.1.8 Schedule and fare co-ordination

One of the factors which determines the attractiveness of a service is the layover at the connecting airport. Travellers do not like to wait for a long time and a short waiting time promotes the service onto higher CRS screens where it has a greater probability of being selected. Therefore, one of the measures taken by allied airlines is to co-ordinate their schedules at the connecting airport to bring their flights closer together. Particular attention is paid to code-shared and block-spaced flights so that they resemble on-line connections as closely as possible. Co-ordination of schedules is often accompanied by attempts to bring the respective gates of the airlines closer so that the walking distance of the connecting passengers is shortened.

Figure 6.11 gives an example of schedule co-ordination between KLM and Northwest Airlines. In 1991, a passenger from Amsterdam bound to Miami would fly to Boston where he/she would wait for 125 minutes for the flight to Miami via Orlando. The flight option has been improved in two ways in 1994. Firstly, the passenger is routed through Detroit where he/she is able to connect to a direct flight for Miami. Secondly, the waiting time at the US gateway has been reduced to 90 minutes. If all the KLM-Northwest or Northwest-Northwest connecting flights from Amsterdam to a US destination are considered, it is observed that the frequency-weighted average connect time at Boston, Detroit and Minneapolis decreased from 138.0 minutes in 1991 to 124.8 minutes in 1994 corresponding to a decrease in time of 9.5%.

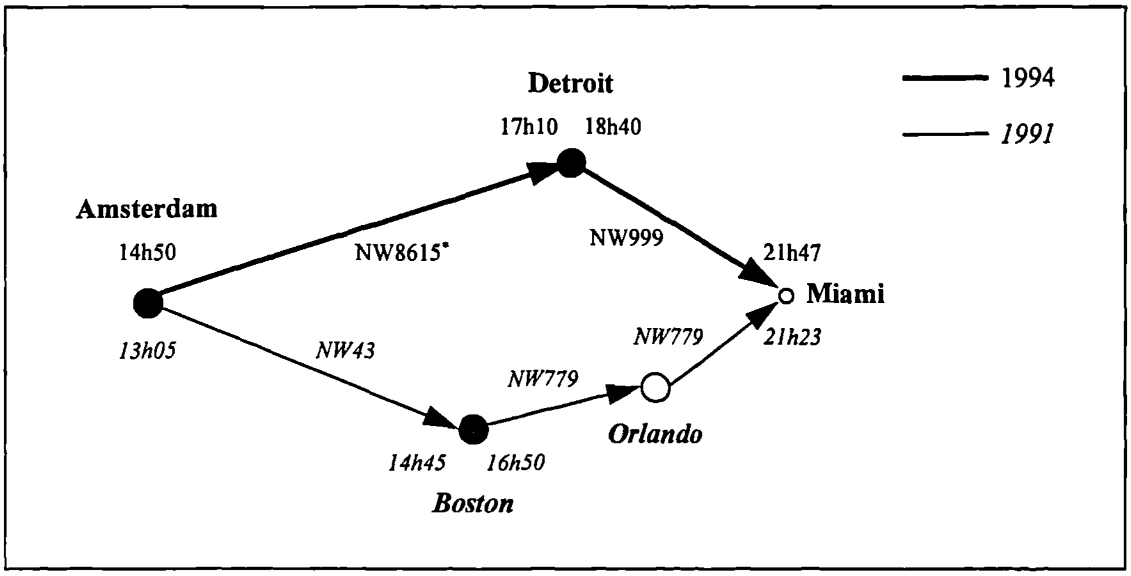


Figure 6.11 Flight routings from Amsterdam to Miami in 1991 and 1994
Source: ABC World Airways Guide, June 1991 and June 1994
(*: code-shared with and operated by KLM)

Joint fare setting is illegal and can only be allowed only if the alliance receives exemption from the law by the regulatory bodies concerned. Unlike schedule co-ordination, the joint setting of fares can act to the detriment of consumers. By agreeing on fares, airlines virtually eliminate fare competition between them and can set fares at an artificially high level without fearing any substantial loss of passengers if they control a large share of the market. The proposed BA-American Airlines alliance is in a good position to do so. Considering that the alliance will control a large share of the UK-US transatlantic market, Alamdari and Morrell[39] argue that fares are very likely to rise.

6.1.9 Service co-ordination

As airlines have attempted to expand their networks by linking them together, they have tried to project themselves as one single entity. The objective is to provide consumers with the so-called 'seamless' service. Ideally, a passenger experiencing seamless travel feels no difference when transferring from one airline to another on the way to his/her final destination. To that passenger, it seems that he/she is

[39] Alamdari, F., and Morrell, P. in 'Competition and clients will suffer' *Travel and Tourism Guide*, June 19, 1996, p. 5.

travelling with only one airline. However, perfect seamlessness is an ideal which can be reached only after a merger when integration is total. In alliances, the degree of seamlessness which can be achieved is limited by various cultural and operational factors.

Alliance partners have tried to project themselves as a single entity by applying a number of marketing ploys which focus on seamless travel. The marketing practices which have been described above form part of those ploys. Code-sharing, block-spacing, franchising, schedule co-ordination and FFP combination all attempt to make the passenger feel that he/she is travelling with only one airline and not with two separate ones. Other means of creating the feeling of seamless travel include through check-in, whereby the passenger checks his baggage only once and collects it only at his/her final destination. Passenger walking distance at connecting airports is also reduced by moving flights to gates which are closer to each other. SAS and Continental, for example, have moved their flights to the same terminal at Newark. However, operational difficulties can be encountered in the form of the unavailability of slots when alliance partners attempt to shift their flights in order to decrease passenger waiting time at connecting hubs.

The discrepancy in the quality of service of the partners in airline alliances is an area of concern for many airlines, namely BA, KLM and Swissair in their alliances with USAir, Northwest Airlines and Delta Airlines respectively. This is because all three European carriers place great emphasis on a high quality of service in order to differentiate their product. There is a great possibility that an alliance with an airline offering inferior service levels might damage their image and lead to a fall in traffic in the long run. Consequently, some airlines, namely KLM and Northwest Airlines, have made efforts to harmonise their service quality levels wherever possible. For example, KLM and Northwest have together designed virtually identical business classes on their transatlantic flights featuring seats offering 48 inches leg room, greater choice of entertainment and a wider range of meals among others. Airlines have also used common advertising and branding to portray the alliance as offering a single transportation system. That is the aim of BA whereby its franchises are unified under the BA Express brand. KLM and Northwest, spurred by their antitrust immunity, have developed the KLM-Northwest World-wide Reliability logo (see Figure 6.12) which incorporates the individual logos of both companies. It is extensively used in promotional material, at the gates and check-in desks and on aircraft (Feldman, 1993b).

Figure 6.12 The KLM-Northwest Worldwide Reliability logo

6.1.10 FFP Combination

Affiliation to an airline's FFP allows passengers to accumulate points on that airline's flights. These points can then be used to obtain upgrades or free flights with the airline when in sufficient number. An FFP is effectively a marketing tool which encourages consumers to continue flying with the airline to whose FFP they belong, and to discourage them from switching to competitors.

Most airline alliances have combined their FFPs allowing passengers to collect points when they fly with either of the partners. Swissair offers a common FFP with Austrian Airlines and Crossair called Qualiflyer. Likewise, Cathay Pacific, Singapore Airlines and Malaysian Airlines developed the common FFP 'Passages' in July 1993. BA has extended its FFP to both its major alliances and its franchises.

Obviously, the larger the network of the airline, the greater are the opportunities to accumulate points and the greater the number of destinations for which these FFP points can be used. Therefore, the size of an airline's network is an important variable defining the attractiveness of its FFP relative to that of its competitors. Alliances enable airlines to expand their networks at low cost and passengers can collect points when flying to more destinations. Furthermore, the passengers are offered a greater number and variety of destinations to choose from when using their FFP points, provided the networks of the partners do not overlap substantially. This by itself makes the airlines in the partnership more competitive.

6.2 Cost-Reduction Strategies

The marketing strategies which have been described aim towards increasing revenues. From the production point of view, the ultimate objective of airline alliances is to improve efficiency and lower unit costs through resource consolidation and joint production (Kilhstedt and Harrington, 1991; Landreth, 1992). Taken together, the marketing and cost-reducing strategies lead to an improvement in the bottom line. In this section, focus is on the areas which offer potential for joint production and resource consolidation. These areas can be classified into five main categories: facilities, labour, capacity utilisation, purchasing and non-core activities.

6.2.1 Facilities

Financial savings can be achieved either by joint use of facilities such as sales offices, airport infrastructure including terminal facilities and lounges, and maintenance bases. The utilisation of the certain facilities can also be enhanced if they are shared. Airlines already strive to reap economies in those ways. For example, KLM has moved to Northwest's terminal at Los Angeles (Feldman, 1993b). Likewise, EQA business passengers could access one another's business lounges (Cameron, 1992) which meant that the airlines could incur savings in not having to set up lounges at certain key airports. Under the 'governor concept' introduced by the EQA in 1992, each carrier took over the sales operations of the alliance in their respective domestic markets. This lead to the closure of certain local sales offices resulting in substantial savings in rent and reservations (Odell, 1994; Zenker, 1992). Joint maintenance brings with it the added benefit of increased utilisation of facilities. Co-operation takes the form of joint maintenance programs as in the case of the agreement between Japan Airlines and All Nippon Airways (Knibb, 1994). Swissair and Austrian Airlines have an agreement on the maintenance of their MD-80 aircraft whereby Swissair is responsible for engines and components while Austrian Airlines makes the larger airframe checks for both airlines (Zenker, 1992). Furthermore, capital costs are reduced as each of the partners are not required to set up separate maintenance bases.

6.2.2 Labour

Rationalisation in labour is closely related to economies derived from the shared use of facilities. For example, closing down sales offices under the EQA's 'governor concept' leads either to cuts in or a reorganisation of the sales force. In the same way, economies are derived through the joint use of ground personnel or by practising reciprocal ground handling. This avoids duplication of personnel at numerous airports and leads to an improved utilisation of the remaining personnel.

Already in 1994, the former EQA was at an advanced stage in this type of co-operation. The EQA partners co-operated at 30 stations in Europe. Swissair no longer has ground handling people stationed at Vienna airport even though it has three daily flights between Zurich and Vienna. Conversely, there are no Austrian Airlines staff at Zurich airport (Feldman, 1993b; Zenker, 1992). The partners also agreed on Vilnius as their joint station run by staff recruited from each of them. Costs were shared equally by the three giving them a cost advantage over Lufthansa which had also opened a station there (Cameron, 1992).

6.2.3 Capacity utilisation

How code-sharing and block-spacing improve capacity utilisation have already been examined in section 6.1.5.3. Airlines also practice joint operation in a limited number of cases to limit capacity. This consists in the operation, by one airline, of an air service whereby another airline shares in both the costs and risks of that service. Joint operation is particularly effective when the markets are of low traffic density. An example of joint service is that offered by Air France and CSA on the Prague-Paris route.

6.2.4 Purchasing

In the area of purchasing, substantial discounts are possible through the practice of joint purchasing. Indeed, the large airline system which makes up the alliance can order any type of commodities in sufficiently large amounts to obtain attractive discounts from suppliers. Important items which can lead to significant savings are flight equipment such as airframes, aircraft engines, aircraft communication and navigation equipment, and spare parts and assemblies. Commonality of product and sensible ordering is needed to achieve substantial results (Wood, 1994). Bulk purchase of fuel from the same supplier can also lead to substantial discounts. Other sources of savings are joint purchase of insurance (as practised by Air Mauritanie and Royal Air Maroc) and of miscellaneous office and on-board equipment. To benefit from synergies in purchasing, the Global Excellence has recently created a common supplies purchasing agency called DSS World Sourcing. It has been set up as a non-exclusive service agent to buy commercial supplies for the three airlines.

6.2.5 Non-core activities

This category includes those activities which are not directly related to airline operation. Examples of such activities offering potential synergies are joint catering and training of personnel, joint revenue accounting, and the integration of electronic and automation systems.

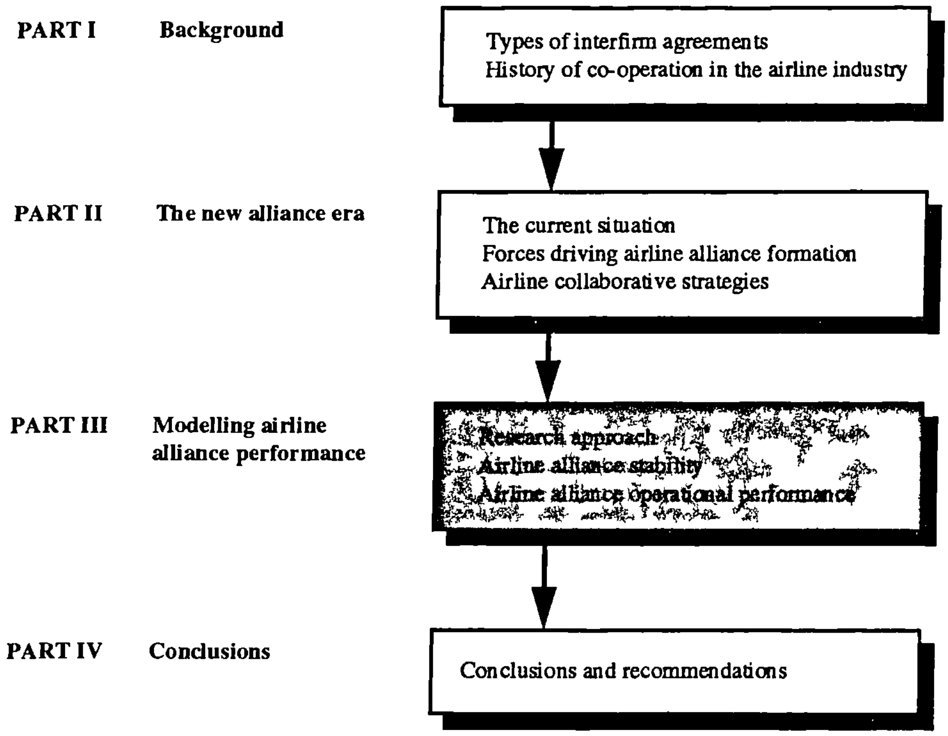
6.3 Conclusion

Collaborative strategies of airlines are aimed towards increasing revenues and/or decreasing costs. Code-sharing is a widely used marketing tool by most airline alliances. It offers the potential to access new markets and traffic feed as well as improved capacity utilisation and better CRS position. Related to code-sharing are block-spacing and franchising which offers the same advantages. Cost-reducing strategies are based mainly on the joint use of facilities and labour, and on the sharing of capacity. Airlines can also increase their power to negotiate discounts with suppliers by practising joint purchasing.

PART III

MODELLING AIRLINE ALLIANCE SUCCESS

The previous two parts have set the background on which this research is constructed. This part consists of the main contribution of this research towards analysing and modelling airline alliance success.



7. RESEARCH APPROACH

Introduction

A good understanding of what is meant by alliance success is key to this research. The aim of this chapter is to provide a proper definition of alliance success. Being clear about what is meant by success will be important when devising quantitative measurements of airline alliance success later.

7.1 The Definitional Problem

Attempting to define alliance success can be rather tricky as success is a very subjective concept. Indeed, success has a different meaning to different firms at different times. Success of a collaborative venture could mean survival to the ailing company or could be synonymous to market domination to the strong firm. The BA-USAir alliance is a perfect example of how the meaning of alliance success can diverge between partners. To BA, success lies in accessing the US domestic market while to USAir, success is to avoid bankruptcy by benefiting from a cash injection.

Furthermore, the literature search has also shown that all too often alliance success is equated to its longevity. In its survey of airline alliances, the Boston Consulting Group took this particular approach. However, as pointed out by Harrigan (1990) and Yoshino *et al* (1995), alliance longevity can result from high exit barriers which force firms to remain in the alliance even though it has achieved its intended goals. These high exit barriers can take the form of capital or assets which are tied up to the alliance. Conversely, termination is does not necessarily an indication of alliance failure. Instead, it could mean that the alliance has achieved the objectives for which it was designed and is no longer required. That is especially the case when the partners ally in order to learn skills and expertise from each other and to capture each other's 'embedded knowledge' (Badarocco, 1991).

7.2 Internal Stability And Operational Performance

For an alliance to produce benefits, it is important for it to be internally stable. Indeed, the relationship has to be structured in such a way that no strain exists between the partners. The internal processes have to occur smoothly between the two firms so that their synergistic potential is not wasted. The importance of alliance stability should not be underestimated. The KLM-Northwest alliance is a good example on how internal instability can inhibit alliance performance. This particular alliance has brought substantial benefits to the constituent airlines. However, even the fact that it can do so is not preventing the two airlines from drifting apart as a result of wrangling at the boardroom level.

Once internal stability is achieved, the alliance can progress beyond mere existence and achieve the set of objectives which was the rationale for its creation. Only when those objectives have been reached can the alliance be considered a total success. The basic argument is that alliance success consists of both successful management and on goal achievement. In addition, as the alliance performs and yields concrete benefits, the partners feel a growing sense of satisfaction concerning their venture. This stabilises the alliance even further. However, successful management, in and by itself, is not sufficient to ensure that the alliance objectives will be reached. Other operational factors which are characteristic of the airline industry, come into play. The situation is represented graphically in Figure 7.1.

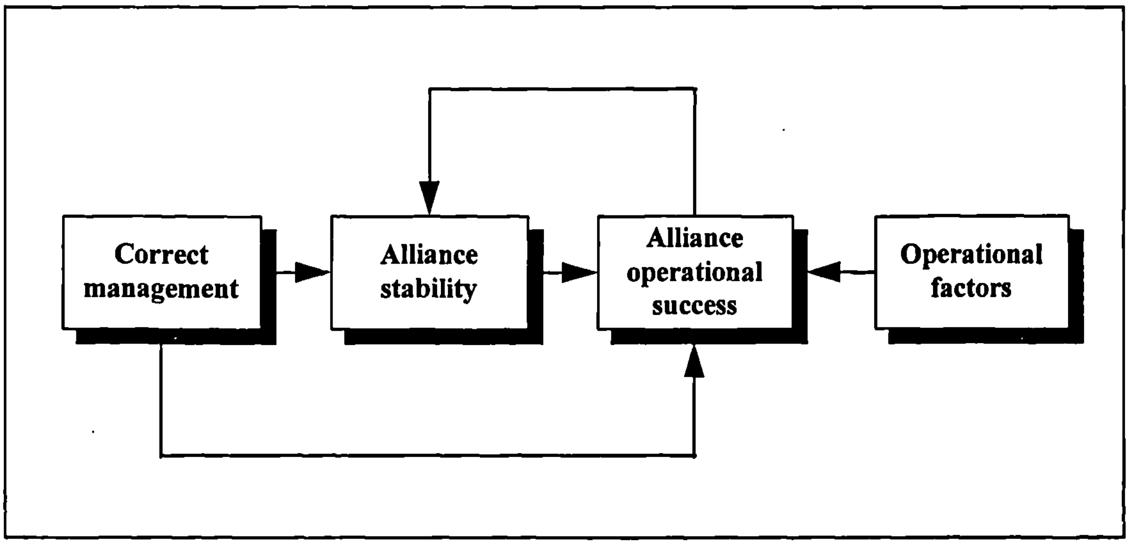


Figure 7.1 The alliance stability-success relationship

In brief, a successful alliance is one which

(1) is stable, and

(2) achieves its objectives.

Measurement of airline alliance success would require the quantification of both. However, it is very difficult to attach a value to the extent to which an airline alliance is stable. Moreover, this might not be necessary since the airline industry is basically a service industry and a great number of studies have been performed on the management of alliances between service companies. Therefore, the investigation of factors contributing to airline alliance stability will be of a qualitative nature and will be based on previous studies which are not necessarily airline-specific. That is the subject of Chapter 8.

Quantification can be performed more easily as far as the alliance objectives are concerned. Chapter 9 will identify the operational goals of airline alliances and their quantification will be dealt with in subsequent chapters.

8. AIRLINE ALLIANCE STABILITY

Introduction

For an airline alliance to succeed, it has to be managed appropriately. This requires a good understanding of how the relationship between two separate firms is structured. It is argued that such an understanding is lacking in the airline industry because airline managers have long been accustomed to the Porterian competitive strategy, whereby a company tackles its competitors single-handedly. This is a major factor causing airline alliance failure.

The aim of this chapter is to discuss the management issues which need to be considered when designing and maintaining a stable airline alliance. Much is borrowed from the extant business and strategy literature and attempts are made to adapt the concepts developed in those fields to airline alliances. The chapter is divided into three main parts. The first part addresses the formation stage of alliances. Once the alliance deal has been struck and the firms start interacting, a number of managerial problems are bound to surface as managers come to terms with the concept of shared control. The issues to be considered at the alliance operational stage are analysed in the second part of the chapter. The chapter concludes with the evolving nature of alliances which alliance managers should be aware of and be able to cope with.

8.1 Stages In Alliance Development

The fact that alliances involve two or more interacting firms which can influence but which can not control one another creates a number of challenges when managing them (Borys and Jemison, 1989; Parkhe, 1993). These managerial and organisational problems have to be thoroughly understood and tackled in the proper fashion as they contribute in bringing about alliance stability, and ultimately alliance success.

Faulkner (1995), for example, finds statistical evidence linking alliance management factors with their ultimate effectiveness in his study of 67 alliances. This is also the main conclusion reached by Parkhe (1993) in an empirical study of alliances grounded in game theory. In a qualitative study of airline alliances, Flanagan and Marcus (1992, p. 23) argue that 'There are no universal structural models that can guarantee success. Rather, it is understanding the fundamental power relationship between the partners and the process by which an airline chooses its partners, and subsequently structures that relationship which is critical to success.' Based on that statement and on the work of Achrol *et al* (1991), three main stages in the development of alliances can be distinguished: the formation stage, the operational stage and the evolution stage. Each stage has to be managed carefully as progress in the next stages depends on its successful completion. The major issues which need to be given adequate consideration at each of the stages are given in Figure 8.1.

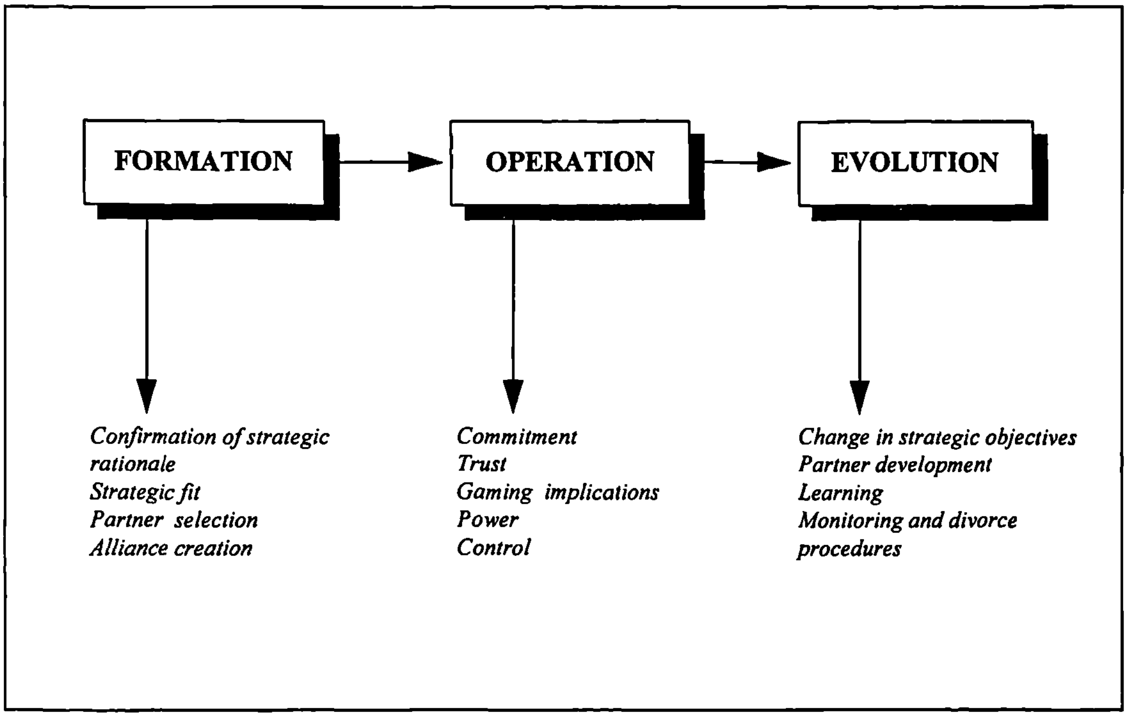


Figure 8.1 Stages in alliance development

8.2 The Formation Process

The alliance formation stage can be modelled into four steps:

(1) Confirmation of the strategic rationale

(2) Setting the criteria for strategic fit

(3) Finding the right partner

(4) Creating the alliance (Lorange and Roos, 1992; Sommerlatte, 1994).

8.2.1 Step 1: Confirmation of the strategic rationale

In the first step, the airline has to be clear about how an alliance can help it achieve its overall business objectives. It is important for it to confirm that an alliance is the best means by which to meet these objectives, rather than going for a merger or acquisition. In so many cases, airlines have formed alliances just because everybody else was doing so. The alliance is bound to fail if the venture is approached with such an attitude. The airline must also be clear about its own objectives for the alliance and what type of alliance is best suited to these objectives. (Flanagan and Marcus, 1992). Key questions which have to be answered are: should the alliance be strategic or tactical, and should it involve equity?; is the alliance going to be indefinite or is it going to be dissolved after a specified time span?

8.2.2 Step 2: Setting the criteria for strategic fit

Sommerlatte (1994) differentiates between two types of criteria for partner strategic fit: hard and soft. The hard criteria evaluate the partner specific strengths and whether they suit the airline's objectives. Examples of hard criteria for an airline alliance are the network size of the prospective partner, the degree of overlap of the networks of the two airlines, the market power of the partner at major hubs, the fleet size and aircraft types in the fleet of the partner, the presence in regions bearing main traffic flows and having the potential for growth, and the financial standing of the prospective partner. The BA-USAir alliance is an example of an airline alliance which did not perform as expected because USAir did not fulfil the financial fitness criterion.

Soft criteria are those which can not be readily quantified and which are, in most cases, purely judgemental. A very important soft criterion is compatibility. Achrol *et* *al* (1990) argue that compatibility between partners replaces the organisational identity, operating system and strategy which is prominent in the single organisation. According to them, compatibility is effectively the glue which holds the partners together. They identify two types of firm compatibility which affect the structure of alliance relationships: organisational compatibility, which can be subdivided into cultural, strategic and functional compatibility, and goal compatibility. In selecting appropriate partners, it is essential for the candidates to exhibit these characteristics (Bucklin and Sengupta, 1992). They are discussed next.

8.2.2.1 Cultural compatibility

Cultural differences are reflected in the very structure of perceiving, thinking and reasoning. Parkhe (1991) identifies three potential sources of cultural friction: the societal context, the national context and the corporate context. Differences in the societal culture lead to differences in problem solving and conflict resolution. For example, in certain cultures, any emerging problems have to be tackled immediately. In other cultures, however, problems are viewed as predestined and have to be fatalistically accepted. Likewise, some cultures regard conflict as healthy while, in others, conflict is to be avoided at all costs. The national context consists of industry structure and institutions, and government laws and regulation (Parkhe, 1991). Three main national contexts emerge world-wide: the Japanese context with its *keiretsu* (large industrial groups of firms representing diverse industries and skills), the US context which views collaboration with suspicion as reflected by its antitrust regulations, and the European context which is characterised by nationalist and protectionist tendencies. Co-operation in alliances can be rendered difficult by the differences in the industry structure in which the two partners thrive, and by the different government laws prevailing. The corporate culture, which is closely related to the previous two contexts, incorporates the values of particular organisations. US companies are known to be addicted to 'a tradition that has long taught managers the dangerously incorrect arithmetic that equates 51% with 100% and 49% with 0%' (Ohmae, 1992; p. 44). Europeans and Japanese, on the other hand, tend to consider their partners as equals and do not put emphasis on control in their co-operative ventures.

8.2.2.2 Strategic compatibility

Strategically, an airline can be a cost leader or marketing oriented. Clashes will result if the partners differ along this dimension by having very different ways of operating. The cost-leader, for example, prefers a structured centralised organisation, while the market-oriented firm will push for greater decentralisation. Strategic incompatibility can also arise if the assets of the firms are not complementary. The BA-United Airlines alliance which was created in 1987 is an example of an alliance which failed owing to non-complementarity of assets. United Airlines main reason for allying was to have access to Heathrow via BA. Once it obtained the traffic rights to Heathrow[40], access provided by BA was no longer required and the alliance was dissolved. The combined assets also need to possess a synergistic potential (Faulkner, 1995). Indeed, there is no point in having very compatible assets which, when combined together, are still unable to beat the competition. Thus, it is very unlikely for alliances between weak partners to produce a strong entity.

8.2.2.3 Functional compatibility

Functionally, alliance partners can differ in the style of management (authoritarian or participatory), delegation of responsibility (high or low), decision-making (centralised or decentralised), and reliance on formal planning and control systems (high or low). Such differences in the way of operating can lead to friction which undermines the stability of the alliance. Parkhe (1991) proposes the creation of unitary management processes and structures where one decision point has the authority and independence to commit to both partners. In that way, problems caused by unclear lines of authority, poor communication, and slow decision-making can be avoided. He recognises that

[40] Following a renegotiation of the US-UK bilateral in 1991, United Airlines and American Airlines were allowed to replace TWA and Pan Am as the only two airlines allowed to serve London Heathrow.

this may be difficult if the partners are equal in terms of size and resource contributions, but it has to be done during the alliance formation negotiations.

8.2.2.4 Goal compatibility

Firms entering into alliances do not necessarily have the same goals (Borys and Jemison, 1989). The KLM-Northwest airline alliance is a case in point. At the time of alliance formation, the interest of KLM lay in accessing the US market via Northwest's extensive domestic network. Northwest, however, was in dire financial straits and was in great need of a financially strong partner to back it up. Differences in objectives are present particularly in alliances between majors and domestic airlines. Indeed, the former are concerned with securing traffic feed and inhibiting competition, while the latter seek survival by benefiting from the protection of a strong carrier.

Achrol *et al* (1990) differentiate between the autonomous goals of the firms and the goals which intersect with the alliance. Conflict can arise as the firms strive to co-operate while retaining their autonomy at the same time (Spekman and Sawhney, 1990). The extent of compromise between the autonomous goals and the alliance goals will define the level of conflict.

The substitute for goal similarity between organisations is goal complementarity which is the extent to which partners perceive that simultaneous goal accomplishment is possible (Spekman and Sawhney, 1990). The goals of the independent organisations in the alliance need not be totally identical. Indeed, achieving one of the partner's objectives does not have to entail disbenefits for the other partner. Goal compatibility therefore creates a win-win situation whereby both partners gain which determines the stability of the alliance. It is important for the partners to recognise that their goals need not be identical since the complementarity issue becomes the common driving force (Lorange and Roos, 1992). Achrol *et al* (1990) argue that avoidance of conflict over autonomous goals is possible by a clear definition of the domain for the partners and the alliance. This can be achieved by introducing specific clauses in the agreement preventing partners from entering one another's business. It is also advisable that the partners do not compete in the same market.

8.2.3 Step 3: Finding the right partner

Finding the right partner is carried out by applying the criteria presented above to a set of potential candidates. However, this can be difficult in the current airline industry because most of the suitable partners are being taken up rapidly. Furthermore, it is extremely difficult to find the partner with an entirely compatible culture (Achrol *et al*, 1990; Faulkner, 1995). The problem is even more acute when partners in different world regions are sought (Yoshino and Rangan, 1995). This is particularly the case of contemporary airline alliances which, in most cases, involve airlines from different countries as they strive to achieve global reach. Therefore, it is essential for each airline management to make great efforts to learn the ideologies of their partners and attempt to understand the different contexts from which the partner comes from (Lewis, 1990). Sommerlatte (1994) proposes the use of a cultural 'map' which graphically compares the cultural positions of the firm and its prospective partner based on a set of criteria. The narrower the gap between the companies, then the lower will be the risk of cultural conflict. However, if the cultural gap is too vast, then it is better to create a joint venture with its own identity.

Analytical considerations need to take into account two dimensions of the prospective partners: (1) how much are they each prepared to invest into and retrieve from the alliance, which effectively asks to what extent is the alliance important to the firm, and (2) their individual strategic position, that is are they leaders or followers in their respective business? Such an analysis will reveal whether the partners complement each other and whether both of them will gain from the alliance. If this is the case, then the chances of success will increase. The question as to whether the partner has a hidden agenda needs to be addressed.

8.2.4 Step 4: Creating the alliance

Once the three stages of alliance formation have been completed, then it is time to create the alliance. In that stage, the partners present their strategic objectives to each other, and detail their expectations of the alliance. Discussion has to be open to create the feeling of trust. Lorange and Roos (1992) identify a number of political and analytical issues which have to be given due attention at that stage of the formation process. They are discussed below.

8.2.4.1 Stakeholder blessing

Internal and external stakeholders can view the alliance as a threat to their careers and power within the firm, to their job, or even to their reputation and they may be concerned about the response of the stock market. They might therefore group themselves to stop the venture. It is therefore imperative to understand their behaviour and consider their demands so that they agree to the alliance. Chances of them accepting are promoted by previous positive experiences and a reputation for trustworthiness in dealings. However, if they continue to oppose the venture, then it is advisable for it to be postponed.

8.2.4.2 Internal support

In striving for internal support, managers have to ensure that the personnel within their organisations who will be participating in the strategic alliance have been adequately documented on the venture and are clear about their tasks. They must also be motivated to carry them out and be prepared to interact with their counterparts. It is advisable for the personnel to be aware of the negotiations quite early so that they are ready for quick task actions during the alliance implementation. This may be difficult in certain cases owing to confidentiality reasons, but should be applied wherever possible.

8.2.4.3 Strategic plan

This stage is effectively concerned with translating the strategic alliance idea into a business plan. Information is gathered to investigate which and how the partners can combine their operations effectively to reach their set objectives. It is only when the business plan has been laid out clearly that the strategic alliance can become competitive.

The formation process is now complete. The partner has been selected, details of co-operation have been hammered out and the alliance is now operational. While the alliance is performing, it is essential to maintain it as it is very easy for it the relationship between the firms to deteriorate. The next section will analyse the structure of inter-firm relationships and, from that, provide guidelines on how to keep the alliance stable.

8.3 Structure Of Alliance Relationships

The basic notion underlining the structure of alliance relationships is that alliances involve the interaction of people. This interaction engenders feelings, which, if good, promote alliance stability. The structure of alliance relationships is defined by the degree of trust into the partner, the level of commitment to the alliance and the degree of power/control exerted or experienced. The alliance situation can be modelled as in Figure 8.2.

8.3.1 Commitment

Achrol *et al* (1990, p. 16) define commitment as 'the desire and intent of participants to give energy and loyalty to an organisation, to be effectively attached to its goals and values, and to sustain the well-being of the relationship'. In their view, commitment of an organisation to an alliance replaces the traditional control mechanisms in single firms, namely a defined line of authority or an internally consistent set of goals. It is essential for participating firms to be committed as they will then be prone to co-operation, communication and more adaptable to conflict. The importance of commitment, exhibited particularly by top management, was highly correlated to alliance success in the study of 67 alliances carried out by Faulkner (1995).

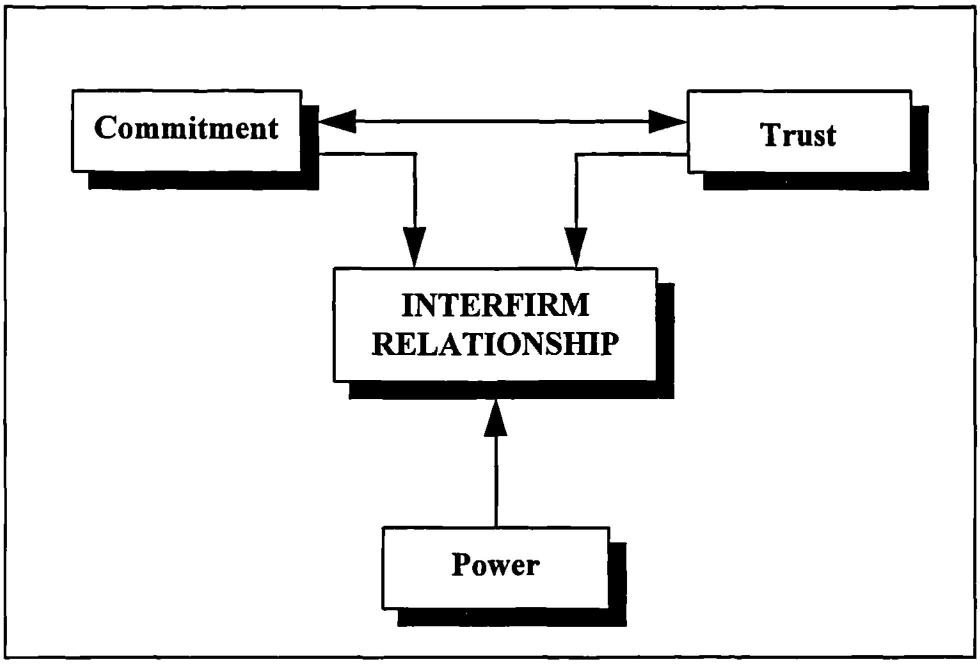


Figure 8.2 Conceptual model of the structure of alliance relationships

The need therefore arises to maintain and enhance the commitment of the partners to the alliance. One way is by the investment of resources which might be either financial, personnel, technological or physical facilities (Cravens *et al*, 1993). The latter deter the investing firm from terminating the relationship as this can lead to their irreversible loss. The involvement of unique physical assets and specialised skills further increases commitment (Williamson, 1985). Achrol *et al* (1990) observe that commitment to the alliance is high if the alliance goals are strategic in nature, that is the success of the participating organisations is highly dependent on the success of the alliance. However, most firms, in particular airlines, would avoid being in such a vulnerable position where their future is dependent on the actions of another company.

Another means by which airlines have attempted to demonstrate their commitment to their alliances has been to purchase a small stake in their partners. These equity investments heighten the investing firm's interest in its partner's success, and therefore increase its commitment to the alliance success. This practice was prevalent in the EQA and the Global Excellence where the constituent airlines had bought into one another. BA is also a firm proponent of equity purchases though, in its case, the purchases are more substantial and unilateral in that it does all the purchasing.

8.3.2 Trust

Driscoll (1978) defines trust of a firm in its alliance partner as the belief that the partner will, without the exercise of influence or control, strive for outcomes that are beneficial for both firms. Achrol *et al* (1990, p. 17) go further to add that 'the level of trust in an alliance is indicated by each firm's confidence in its partner's sincerity, loyalty, and willingness to refrain from opportunistic[41] behaviour.' A feeling of trust within the alliance context favours more open communication, greater clarification of goals and problems, more extensive search for alternative courses of action, and a greater motivation to implement decisions (Zand, 1972). Trust is an important factor when it comes to withering the effects of unforeseen changes in the operating environment of the partners and of the alliance, and is seen as key to sustaining alliance stability (Jarillo in Borys and Jemison, 1989).

Trust is a very important factor in airline alliances and has been known to be the cause of failure behind a number of airline alliances. The sense of mistrust felt by Lufthansa in its negotiations with American Airlines caused it to prefer United Airlines as its US partner (Jennings, 1995b). American Airlines also got into problems with Japan Airlines (JAL) when, after one year's of negotiation for linking up the airlines'FFPs, it asked the US DoT to reject JAL's application to serve Honolulu from Sendai. More recently, the KLM-Northwest Airlines alliance was undermined when Northwest felt that KLM wanted to take control of it and consequently adopted a measure to prevent KLM from gaining further control into it. In order to rekindle the feeling of trust, KLM has withdrawn three senior executives from the board of Northwest.

[41]Examples of opportunistic action, in this context, could be withholding or distorting information, shirking or failing to fulfil promises, appropriating a partner's proprietary technology or key personnel, making payments late, or abruptly abandoning the alliance.

Like in any kind of relationship, trust takes time to develop. However, an examination of the past relationships of prospective partners gives an indication as to whether they are worthy of trust[42]. American Airlines, for example, is notorious in that it has a string of failed code-sharing partnerships. This, according to a code-sharing expert, is 'not an insignificant fact'[43] for potential partners. Unilateral commitments as proposed by Gulati *et al* (1994) contribute to nurture the feeling of trust in the alliance context. Taking the risk of committing resources to the alliance activities even before the contract has been agreed upon and sealed gives a strong indication that the firm takes interest in the success of the alliance and is therefore worthy of trust. Achrol *et al* (1990) argue that trust depends on the manner in which interfirm interactions are organised and conducted. For example, interactions between people of the same status from the two different organisations facilitate trust. The attitude taken towards the partner is also important. Indeed, considering the partner on an equal basis and taking a problem-solving attitude rather than one emphasising control generates trust.

8.3.3 A game-theoretic perspective of alliances

Low levels of commitment and trust and a high degree of power induce cheating. This tendency to cheat prevails because one partner finds it 'advantageous to maximise his own gains at the expense of the venture' (Hennart in Parkhe, 1993; p. 796). The alliance situation characterised by two or more interacting firms which are mutually vulnerable to one another but which can not control one another's behaviour, and which can be tempted to cheat at any time makes game theory an ideally-suited tool to study the structure of alliance relationships. The application of game theory to alliances was performed by Gulati *et al* (1994). Their work which is is presented below confirms the importance of unilateral commitments in generating trust.

[42] Parkhe (1993) refers to this as the 'shadow of the future'. He confirms statistically that the performance of a strategic alliance will be positively related to the length of the 'shadow of the future' that is cast.
[43] Airline Business, June 1995, p. 25.

8.3.3.1 The Prisoner's Dilemma

Different scenarios exist to conceptualise this unstable situation prevailing between two firms, the most common one being termed the Prisoner's Dilemma. In the Prisoner's Dilemma, the two firms are assumed to have a choice of two options: co-operation or non co-operation. The hypothetical outcomes of the different choices of action are depicted in Figure 8.3. Co-operation with each other yields a greater payoff than if neither co-operate. However, the temptation to act opportunistically is high as the non co-operative partner can receive the highest possible pay-off while the other loses out. Consequently, each partner fears that the other will cheat while it itself co-operates in good faith which ends up in non co-operation on the part of both who hence end up worse off than if they had co-operated in the first place.

		Company B	
		Co-operate	*Not co-operate*
Company A	*Co-operate*	**Outcome** Company A: 7 Company B: 7	**Outcome** Company A: 3 Company B: 9
	Not co-operate	**Outcome** Company A: 9 Company B: 3	**Outcome** Company A: 5 Company B: 5

Figure 8.3 Hypothetical payoffs in the Prisoner's Dilemma situation
Source: Gulati et al (1994)

The Prisoner's Dilemma therefore assumes that each company's best response to its partner's choice of action is the same regardless of what its partner chooses, that is non-co-operation. One might argue that if alliances grounded in the Prisoner's Dilemma are bound to fail, then each prospective partner should rationally anticipate this and not enter the alliance in the first place. However, according to Gulati *et al* (1994), allying companies expect to benefit from the formation of the alliance itself, that is, even if neither co-operate, they still expect to get better payoffs that they would without the alliance. Consequently, they argue that taking the Prisoner's Dilemma as the only available alliance structure guarantees the failure of the alliance. They therefore propose an alternative structure which could be more effective in preserving alliance stability.

8.3.3.2 The modified alliance scenario

The new outcome of firm interaction is depicted in Figure 8.4. In the improved game-theoretic model, the tendency for non co-operation does not dominate over that for co-operation as in Figure 8.3. Indeed, company A's co-operation is best responded to by co-operation from company B.

		Company B	
		Co-operate	*Not co-operate*
Company A	*Co-operate*	**Outcome** Company A: 9 Company B: 9	**Outcome** Company A: 4 Company B: 7
	Not co-operate	**Outcome** Company A: 7 Company B: 4	**Outcome** Company A: 5 Company B: 5

Figure 8.4 Hypothetical payoffs in the modified game-theoretic model
Source: Gulati et al (1994)

Likewise, the best response to non-co-operation is non-co-operation itself. The need, however, arises to sway the equilibrium towards co-operation and Gulati *et al* (1994) propose the use of *unilateral commitments* as a means of achieving that goal. Such unilateral commitments could be an emphasis on the importance of the alliance by committing the firm's reputation to its success, a unilateral commitment of resources, or a promise of exclusivity. These commitments from one or both partners indicate that the firm has all the intentions of co-operating, will not indulge in any type of opportunistic behaviour, and hopes for a reciprocal commitment When one of the firms has made such commitments, the other can then decide on how it is going to move. This sequential mode of action can result in a better outcome in terms of alliance performance and stability. The effectiveness of unilateral commitments in maintaining robust relationships is confirmed by Parkhe (1993) who demonstrates empirically that the level of commitment of non-recoverable investments in a strategic alliance is negatively related to the perception of opportunistic behaviour.

8.3.4 Power and control issues in interfirm relationships

Power is central to alliance relationships (Flanagan and Marcus, 1993; Thorelli, 1986). The emergence of power of one of the firms in an interfirm relationship is due either to unequal resource endowments (Emerson, 1962) or size (Osborn and Baughn, 1990) which leads to an imbalance in the interdependence between the firms. This imbalance can be particularly prevalent in alliances between major airlines and regional/domestic airlines. Bucklin and Sengupta (1992) argue that power imbalances are potential sources of conflict in that the more powerful partner can abuse of its position and is very likely to behave opportunistically. Furthermore, the more powerful partner can use its position as a bargaining chip and restrict access of its partner to resources in its possession (Harrigan and Newman, 1990). The weaker partner, when confronted to a situation of inferiority, will react to limit its vulnerability in various ways, one of them being involvement in competing alliances. This can engender a chain reaction ending in both firms failing to achieve their initial goals. Hence, Bucklin and Sengupta (1992) hypothesise and confirm their hypothesis statistically that power imbalances undermine interfirm relationships.

They consequently propose that the balance of power can be levelled by the use of the law of contract whereby weak firms can control the behaviour of their stronger partners and can be compensated in case of deviation from the initial agreement. Four means of balancing the relationship via contractual governance are identified: (1) formality, (2) exit barriers, (3) exclusivity, and (4) financial incentives. Formality is addressed in the legal document itself which constrains the behaviour of the stronger party. Raising of exit barriers is possible by designing long-term agreements or by incorporating penalties if the partner were to leave the alliance prematurely. Exclusivity clauses in the contract prevent the partner from allying with other firms, and financial incentives involve equity investments, direct monetary payments or commissions on joint sales. Regression analysis performed by Bucklin and Sengupta (1992) confirm that the combination of those characteristics of contractual governance reduce the power imbalance in an alliance. However, significant costs (Williamson, 1985) can be incurred in using the law to protect one's interests in case the contract has been breached. Furthermore, over-emphasis on the legal aspect can undermine the feeling of trust which is important for alliance stability.

Once the alliance has been properly formed and is being adequately maintained, it will start evolving. It is important for managers to realise that alliances are prone to evolution resulting from changing external and internal circumstances, the repositioning of partner priorities and interpartner learning. The evolutionary aspect of alliances is considered next.

8.4 Alliance Evolution

Faulkner (1995) considers alliance evolution as a prerequisite for survival. According to Thorelli (1986), an alliance will wither unless efforts are consciously made to induce the alliance to evolve. Achrol *et al* (1990) define four successive stages in the temporal development of alliances: (1) the entrepreneurial stage, (2) the collectivity stage, (3) the formalisation stage, and (4) the domain elaboration stage. The alliance evolution model is graphically represented in Figure 8.5 and the different stages are described in some detail.

The entrepreneurial stage, as the name indicates, is characterised by an entrepreneurial spirit which encourages innovation, creativity, acquisition and control of resources, and development of an ideology. Success is then determined by adequate resource acquisition, growth, flexibility and the development of external support. The collectivity stage is more concerned with human resource management. Success is defined by the development of commitment, cohesion and morale, and informal and open communication among personnel involved in the alliance.

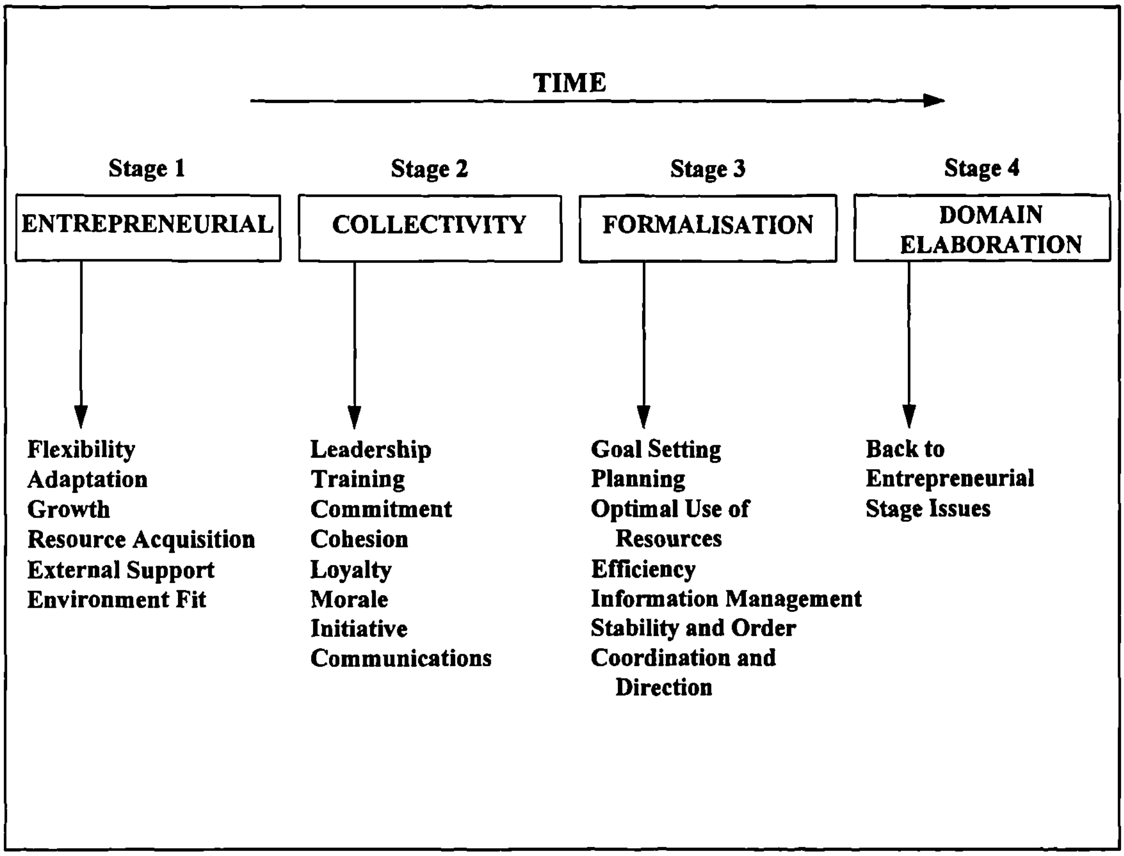


Figure 8.5 Alliance development model
Adapted from Achrol et al (1991)

Successful completion of the first and second stages leads to alliance stability on which the formalisation stage can build. At that point, policies and procedures within the alliance have become institutionalised and alliance goals formalised. Efforts can then be made to reach those goals and success comes in goal attainment. The final stage-domain elaboration-is more of an aftermath when the alliance seeks to renew itself and expand its domain. This is achieved by a re-evaluation of the strategic goals, domains and synergies between partners.

SAS explains its devolvement from the EQA six years after its creation by the alliance's lack of evolution. According to SAS, the alliance never progressed much beyond the collectivity stage and it was too slow in yielding benefits. Hence, SAS has preferred to strengthen its ties with Lufthansa.

8.4.1 Strategic incompatibility

Strategic incompatibilities can also arise after alliance formation as the interests of the partners change. This is particularly so in the volatile air transport environment. Parkhe (1991) argues that one way to ensure alliance stability in that case is to build flexibility into the partnership structure which can allow the partners to cope with the changes in their internal and external environments. Flexible structures can be developed by starting co-operation on small scale, short-term projects and then gradually progressing towards more extensive co-operation. This enables strategic fit between the partners to be assessed on a continual basis. Another alternative is to enter into a general co-operative agreement which is activated only when required.

8.4.2 Flexibility, balanced development and bonding

Considering the evolutionary nature of alliances, Faulkner (1995) identifies flexibility as an important factor in the success of alliances. Indeed, when circumstances change, the alliance should have inbuilt mechanisms which allow it to adapt. Managers should also be trained to accept the tendency of alliances to change, and should be capable of coping with it.

As the alliance moves along its evolutionary path, there is bound to be some discrepancy in the development of the individual partners. Faulkner (1995) therefore recommends that a balanced development should prevail for alliance stability. The BA-USAir and KLM-Northwest alliances are cases in point. A study by the Gellman Research Associates[44] in the US on the benefits of code sharing has indicated that BA and KLM are reaping substantially greater benefits than their US partners. Northwest Airlines is also blaming KLM of furthering its interests at its expense, which is undermining the agreement.

A third recommendation by Faulkner (1995) is for the partners to create bonding mechanisms which will prevent alliance dissolution. He identifies three bonding mechanisms:

---

[44] See Chapter 4.

(1) Combined problem resolution

(2) Regular personnel exchange

(3) Combination of cultures.

The first two mechanisms are relatively easy to implement in the context of airline alliances. However, some resistance is anticipated where the third mechanism is concerned.

8.4.3 Interpartner learning

Involvement into a strategic alliance necessarily entails an opening-up of the organisations to their partners who then have access, to a certain degree, to their competencies. Learning via the alliance can then enable one of the firms to acquire the skills and technologies it did not possess at the time of alliance formation so that it may eventually not need its partner any more. Taking a rather extreme view, Parkhe (1991) and Hamel (1991) observe that alliances can become races to learn: the company which internalises the core abilities of its partner faster can then dominate the relationship by increasing its bargaining power and eventually become a formidable competitor. From that, it can be argued that the stability of the alliance can depend on the degree to which the partners can learn each other's core expertise. The less they learn, the better, since they will then continue to need their partner as they did at alliance formation. It therefore becomes important to devise means to protect the firms' core competencies. Faulkner (1995) notes that this view of alliance development is too narrow in that it does not take into account the synergies which result from the alliance. Though one partner has learnt all about the skills of its counterpart, it still needs it to translate the synergistic potential of the alliance into tangible benefits.

In marketing airline alliances where the goal is the achievement of economies of scope and density, interpartner learning is not relevant (Porter and Fuller, 1985). However, an airline can use its alliance to learn about its market and pricing strategies. The problem is more serious if the alliance allows an airline to have access to strategically important data of its partner. This could make it a serious competitor in case the alliance were to break. Learning can also be prevalent in cost-reducing alliances. For example, an alliance can allow an airline to have access to maintenance expertise and knowledge which takes time to acquire via the usual channels. Therefore, it becomes important for airlines to develop safeguards protecting their core expertise, keeping in mind that current airline alliances are quite unstable and that their partner could be a competitor in the future. Conversely, for the alliance to be stable, alliance managers should not view the implementation of safeguards as an indication of distrust.

8.4.4 Monitoring and divorce procedures

Having recognised that change is inherent to alliances, it is important to set up procedures such as communication links and organisational structures to constantly monitor and reassess the alliance. For example, the Global Excellence has created a Steering Committee of the CEOs charged with planning long-term alliance strategy. Senior executive committees are also charged with generating proposals for areas of co-operation while the responsibility of some functional managers is to facilitate co-operation (Flanagan and Marcus, 1993). The break-up of an alliance can be a rather bitter experience as the parties wrangle over who owns what. Therefore, procedures should be established at the outset as to how the separation will take place, if ever it does happen.

8.5 Conclusion

This chapter has attempted to bring together selected important issues pertaining to the management of alliances which have been raised in the extensive business and strategy literature. These points could be useful to managers of airline alliances as they attempt to make their alliances stable and eventually successful. Partner selection is an important initial stage in the alliance formation process in which consideration has to be given to the different types of partner compatibility, namely organisational and goal compatibility. Once the partner has been selected, a formal procedure which focuses on a number of political and analytical issues has to be adopted in creating the alliance. After the agreement has been finalised and the partners start working together, the structure of the relationship has to be carefully managed. Consideration has to be given to the level of partner commitment, the amount of trust and the balance of power within the relationship. Analysis grounded in game theory shows that alliance stability is enhanced if the partners do not perceive the alliance from the Prisoner's Dilemma perspective. Unilateral commitments are primordial to sway the relationship away from that. Finally, this chapter recognises the importance of alliance evolution and the need for continuous reassessment.

9. AIRLINE ALLIANCE STRATEGIC OBJECTIVES

Introduction

Two meanings of airline alliance success were identified in Chapter 7. Stability as a success criterion was used in Chapter 8 and the factors contributing to the endurance of the alliance were presented. The second alliance success criterion, the attainment of objectives, is now applied. The aim of this chapter is to analyse the objectives of airline alliances in depth and from that, classify them in a way that facilitates their future measurement.

9.1 Airline Alliance Performance Measurement

A very important consideration when attempting to measure airline alliance performance is to differentiate between long-term and medium-term objectives. These are usually not identical though achieving the medium-term objectives enables the fulfilment of the long-term ones. In the airline alliance context, the long-term goal of airlines adopting the alliance strategy is to reap financial returns in the form of either increased revenues or decreased costs or both. What they seek is an eventual improvement in their bottom line. Medium-term goals of alliances are more of an operational nature, such as the increase in market share or the dominance of a market.

Focus on the long-term objective of airline alliances would mandate the application of traditional financial measures such as Return on Investment, Return on Sales, Growth in Revenues, Cash Flow/Investment, Average Return on Total Capital and the like to the assessment of airline alliance performance (Chakravarthy, 1986). However, a serious drawback in the use of the financial measures is that while they are appropriate in measuring the strategic performance of an airline as a whole, they would not lend themselves easily to the measurement of the alliance performance specifically. This is because it is virtually impossible to separate the financial payoffs of the alliance from the overall financial results of the airline owing to the inappropriateness of the current reporting procedures. Moreover, it is doubtful whether airlines themselves have implemented mechanisms to isolate the benefits of their alliances.

In order to circumvent this problem of separability, it is deemed preferable to take one step backwards in the airline goal hierarchy so as to focus on the medium-term objectives of airline alliances. In other words, the operational performance of the alliance is monitored. *Alliance success is then given by the extent to which alliance-specific goals have been achieved.* The change in value of the measured variable from a defined pre-alliance period to a defined post-alliance period measures alliance success for that particular goal. This approach requires the identification of the alliance-specific objectives of airlines, which is considered next.

9.2 Identification And Classification Of Airline Alliance Objectives

The strategic rationale for the creation of an airline alliance can essentially be analysed from two perspectives: supply (production) and demand (marketing). On the supply side, the objectives are to decrease production costs and increase efficiency. Demand-side objectives consist mainly of accessing new markets, benefiting from traffic feed and increasing market power. In economic terms, the achievement of these objectives allows the airlines to reap economies of scale, economies of scope and economies of density. The relative importance of the operational goals can be judged from a survey carried out by Flanagan and Marcus (1993) with a sample of 118 airlines. The results of the survey are summarised in Figure 9.1.

9.3 Supply-Side Alliance Goals

On the supply side, the strategy is to combine certain of the partners' operations in order to decrease unit production costs and to increase the utilisation of resources. In economic terms, this equates to economies of scale. The areas of production in which rationalisation of operations are possible were detailed in Chapter 6. It is important to distinguish between economies of scale in specific production sectors and economies of scale accruing from overall airline size which are considered further. Therefore, supply-side economies of scale will hereafter be referred to as economies of integration.

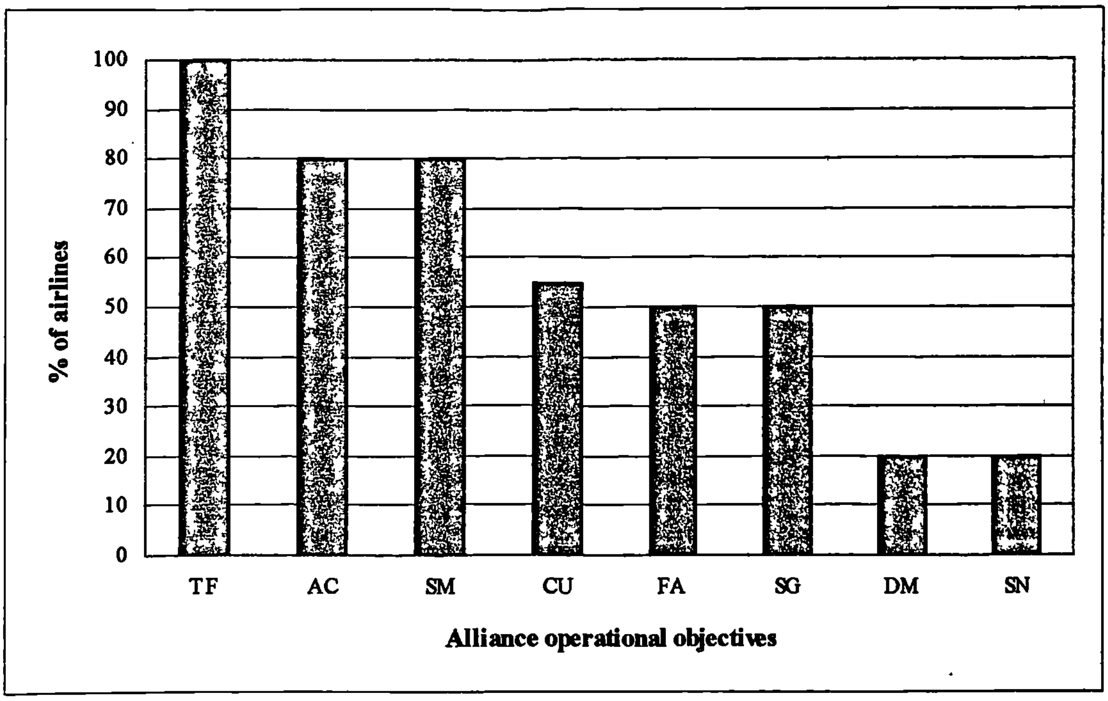


Figure 9.1 Relative importance of airline alliance objectives
Source: Flanagan and Marcus (1993)
Key:
TF: traffic feed; AC: access to new markets; SM: sales/marketing scale; CU: increased capacity utilisation; FA: facilities scale; SG: station and ground scale; DM: defence of current markets; SN: scale in non-core activities.

9.4 Demand-Side Alliance Goals

On the demand side, alliances enable airlines to satisfy their need to grow. That growth is a motivator for airline alliance formation was demonstrated by Youssef (1992) who found a statistically-significant difference between the means of the sizes of allied and non-allied airlines. Why is the growth imperative prevalent in the airline industry? This is because size carries with it a number of network-based advantages termed as economies of scope and density. There is also a belief that increased size leads to economies of scale. The next sections will elaborate upon the relevance of these economies in the context of airline alliances.

9.4.1 Economies of scale

By definition, economies of scale are realised when unit costs decrease with increases in total production (that is, firm size). The hypothetical existence of economies of scale in the airline industry has been the subject of a large number of studies[45]. In a review of the most prominent ones, White (1979) concludes that cost advantages as a result of size alone do not exist in the airline industry, other factors such as average stage length, traffic density, and input prices remaining constant[46].

Do alliances bring about scale economies? The fundamental question here is whether the unit costs of allied airlines is significantly lower than that of non-allied airlines. If ever these economies exist, they will be revealed by a significant degree of association between airline unit costs and airline and alliance size after adjustments for airline traffic density, stage length and input prices. In a preliminary attempt to detect the existence of economies of scale due to alliance formation, the unit cost of 44 airlines[47] in 1993 is plotted against their size and the size of the alliances to which they belong (see Figure 9.2 and Figure 9.3). Size is measured by airline total available seat-kilometres (ASK). The sample of airlines contained a nearly equal mix of those actively involved in alliances and those not so much involved into it: 21 airlines had less than 5 alliances while 23 had more than 5 alliances.

From Figure 9.2 and Figure 9.3, one can observe that there is no distinct variation of unit cost with alliance size so that economies of scale due to airline and alliance size are virtually non-existent. In fact, it would seem that airlines and alliances are subject to constant returns to scale as evidenced by the horizontal least-squares regression line.

[45] These studies include Caves (1962), Gordon (1965), Strazheim (1965), Eads *et al* (1969), Jordan (1970), Eads (1972), Keeler (1972), Reid and Mohrfield (1973) and Douglas and Miller (1974).

[46] Antoniou (1991) however notes that inadequacies in the methodology and the absence of correction for network and technological characteristics in the studies can conceal the cost advantages arising from airline size.

[47] ASK data was obtained from *ICAO Digest of Statistics-Financial data* (1994) and *IATA WATS* (1994). Crude sample data is provided in Appendix A.

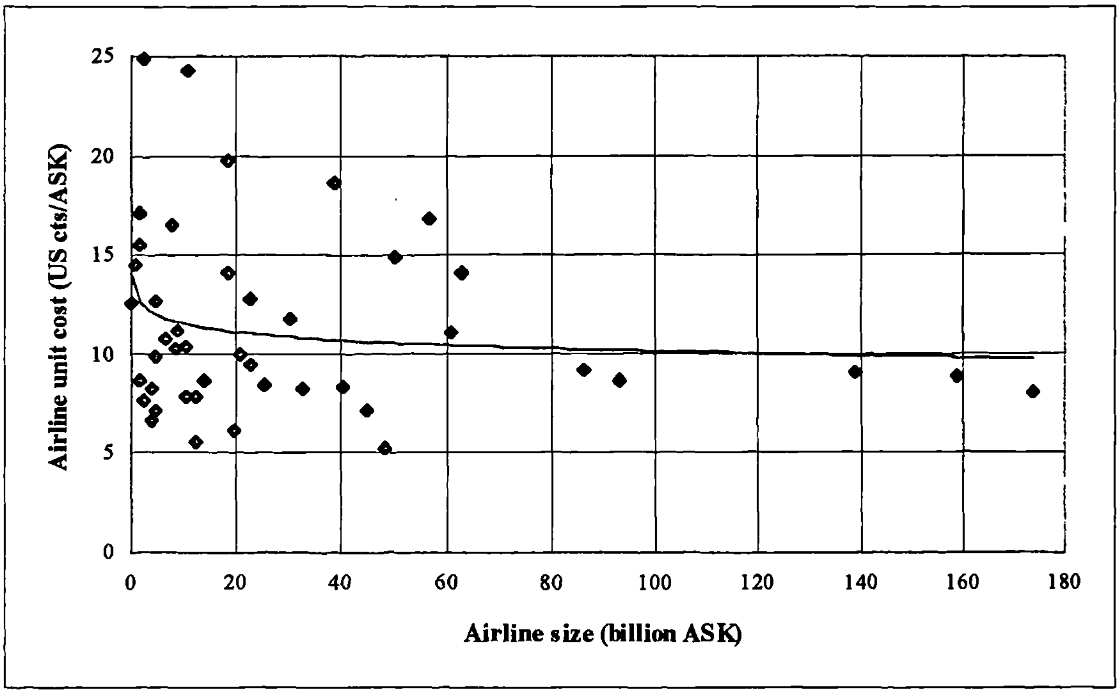


Figure 9.2 Variation of airline unit cost with airline size

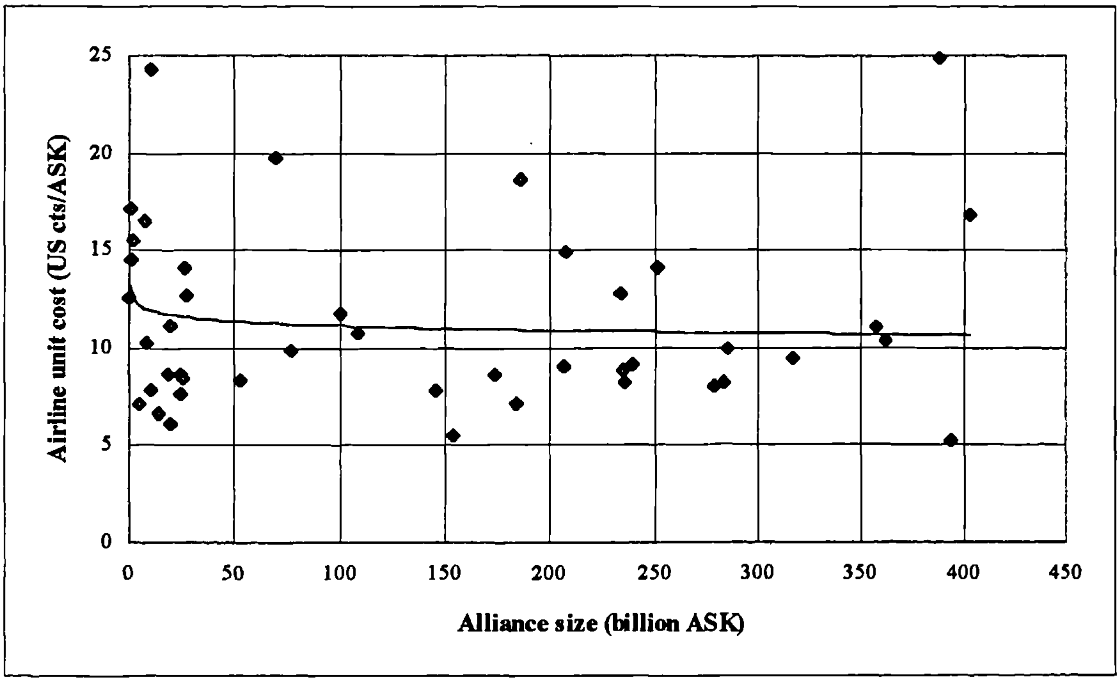


Figure 9.3 Variation of airline unit cost with alliance size

In order to control for the effects of network traffic density, stage length and input prices, these variables are inserted in a function explaining unit costs:

$$\left(\frac{TCOST}{ASK}\right)_a = f\left[ASK_a, LF_a, ASL_a, \left(\frac{LCOST}{ASK}\right)_a, ASK_A\right] \quad \textbf{(Eq. 9.1)}$$

where

subscripts '*a*' and '*A*' respectively refer to the airline and the alliance to which it belongs;

$\frac{TCOST}{ASK}$ is the unit cost of the airline as given by the ratio of total costs to output;

ASK is the measure of firm size (airline or alliance);

LF is the average load factor on the airline's network. It is used as a proxy for traffic density on the airline's network[48];

ASL is the average stage length in the airline's network;

$\frac{LCOST}{ASK}$ is the unit labour cost of the airline. This value is used as proxy for input prices[49]. Labour costs are used since they constitute a high proportion of the inputs to producing a seat-kilometre.

Simple linearity in Equation 9.1 is assumed and both linear and logarithmic[50] equations are specified:

$$\left(\frac{TCOST}{ASK}\right)_a = x_0 + x_1(ASK)_a + x_2(LF)_a + x_3(ASL)_a^{-1} + x_4\left(\frac{LCOST}{ASK}\right)_a + x_5(ASK)_A$$

(Eq. 9.1a)

$$Ln\left(\frac{TCOST}{ASK}\right)_a = Ln(x_0) + x_1 Ln(ASK)_a + x_2 Ln(LF)_a + x_3 Ln(ASL)_a^{-1} + x_4 Ln\left(\frac{LCOST}{ASK}\right)_a$$
$$+ x_5 Ln(ASK)_A$$

(Eq. 9.1b)

The reciprocal of *ASL* is used in the regression since it is known that unit costs decrease exponentially with length of haul (see Figure 9.4). In models 9.1a and 9.1b, a

[48] Load factor has been used for traffic density correction in a number of studies investigating the existence of economies of scale in the airline industry. See White (1979) for a comprehensive listing of the studies.

[49] An arguably better indicator of the difference in input prices would have been the Purchasing Power Parity. However, this measure was not available for all the countries in which the airlines in the sample were based so that it was not used.

[50] The logarithm of the variables is used as that transformation is known to even out the problems of variable non-normality (Norusis, 1993).

positive and statistically-significant value of the coefficients x_1 and x_5 would indicate the existence of economies of scale in airline size and alliance size respectively. The results of the multiple linear regressions are given in Table 9.1.

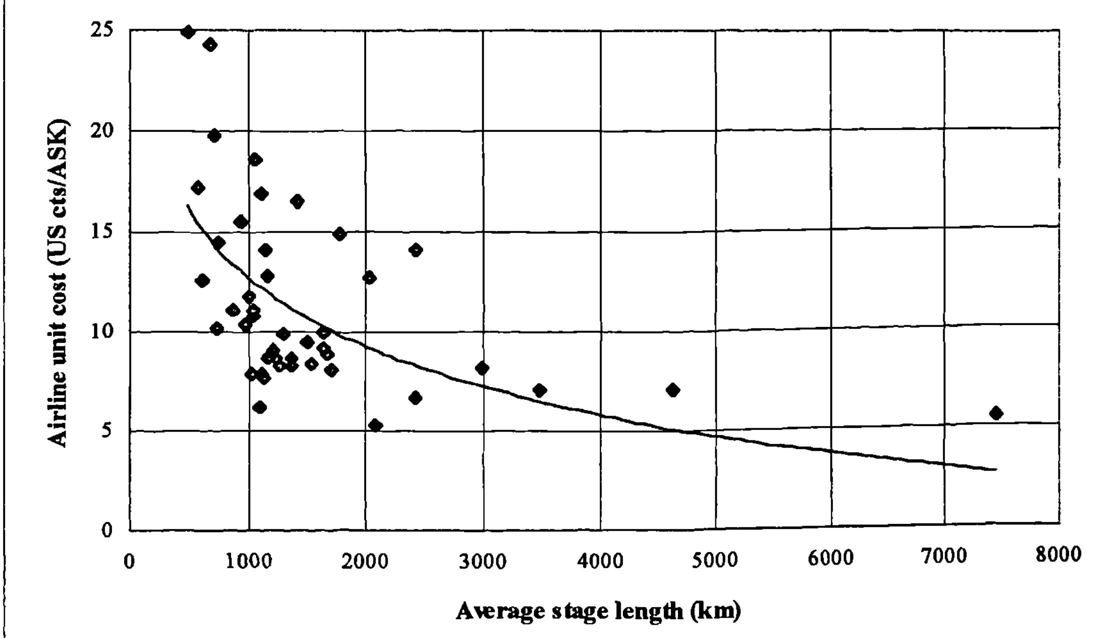


Figure 9.4 Variation of airline unit cost with average stage length

Both models are valid as concluded by their highly-significant F statistics. Their explanatory power as given by the $\overline{R^2}$ values is very satisfactory considering that the analysis was of a cross-sectional nature. The linear model was more powerful than the logarithmic model, explaining approximately 72 per cent of the variation in the data. The coefficient of ASK_A is statistically non-significant at the 5% significance level in both models pointing to the conclusion that changes in alliance size do not affect airline unit cost[51]. The coefficient of ASK_a is also statistically non-significant at the 5% level. One can therefore conclude that economies of scale at the airline level are non-existent as well.

[51] It was also attempted to regress alliance unit cost against alliance ASK. Very poor results were obtained confirming the hypothesis that no economies of scale exist at the alliance level.

Coefficient	Associated variable	Linear model	Log model
x_0	*Constant*	-1.134 (-0.102) [0.9199]	5.181 (1.577) [0.1291]
x_1	ASK_a	-1.427e-8 (-1.228) [0.2323]	-0.116 (-1.511) [0.1451]
x_2	LF_a	-0.043 (-2.027) [0.0078]	-0.138 (-2.143) [0.0089]
x_3	ASL_a^{-1}	6274.118 (2.939) [0.0076]	0.194 (2.419) [0.0243]
x_4	$\left(\frac{LCOST}{ASK}\right)_a$	1.240 (2.822) [0.0099]	0.330 (3.515) [0.0020]
x_5	ASK_A	-4.022e-9 (-0.992) [0.332]	0.041 (1.128) [0.2715]
Model test statistics			
$\overline{R^2}$		0.716	0.644
F		14.557 [0.0000]	10.774 [0.0000]

Table 9.1 Regression results for the detection of economies of scale
(t-statistics in circular brackets and levels of significance in square brackets)

Unit labour cost, average stage length and load factor are the only variables affecting airline unit cost. Their coefficients have the expected signs and are significant at the 1% level of significance in both models. Since coefficients can be interpreted as elasticities when regressing the variables in logarithmic form, the results of the regression indicate that an increase of 1 per cent in input prices would lead to an increase of approximately 0.3 per cent in unit costs, average stage length and traffic density remaining constant. Likewise, a 1 per cent increase in network load factor decreases unit costs by approximately 0.15 per cent with input prices and average stage length maintained constant, and a 1 per cent increase in $\frac{1}{ASL_a}$ can increase unit costs by approximately 0.2 per cent, traffic density and input prices remaining constant.

Many studies have econometrically demonstrated that there are no cost advantages to be gained solely from size. The above analysis has gone one step further by showing that such benefits are also non-existent at the alliance level. In spite of that, the belief that size can bring about this particular type of economies still remains in the airline industry. Youssef (1992, p. 10) argues that this is what is leading airlines to ally: 'Perceptions [of scale economies] are a strong motivator.......Airlines may consequently seek equity alliances as a means of achieving economies of scale in production, whether or not such economies exist'. This could be true. However, a more plausible explanation for the tendency for airline growth could be that airline size confers advantages other than economies of scale. Those other advantages of size come in economies of scope, increased market power and economies of density.

9.4.2 Economies of scope

Scope economies exist when it is less costly to produce multiple products jointly rather than producing each product separately. Most of the scope economies in the airline industry are related to the size of the network and its structure, with each city-pair in the network being the location where the output (revenue passenger-kilometre) is produced. Simultaneous production on a large number of city-pairs (the network) is much more economic than separate production on each one of the city-pairs. Also, it is more economical for a new route to branch out from an existing network (Johnson, 1985; O'Connor, 1995). Evidence of economies of scope in the airline industry is provided by Weisman (1990) who finds that airline output on a network is dependent upon the overall network structure.

Levine (1987) identifies information dissemination (marketing and advertising) as an important source of economies of scope. Indeed, it is proportionately less costly to advertise an airline product over a whole network of routes rather than on a single route. This is due to the availability of media discounts which cause advertising costs to be less than proportionally related to the number of city-pair markets served

(Hanlon, 1996). Moreover, there are indivisibilities associated with public media (newspapers and television) which make it preferable to offer the airline information to a large, geographically dispersed audience (Levine, 1987).

FFPs, travel agency overrides, and corporate discounts also exhibit to economies of scope as they necessitate large networks for them to be effective and economic. FFPs work effectively in attracting traffic only when the airline offers a large number of city-pairs on which FFP points can be collected and thereafter used. Travel agency commissions are related to the proportion of the traffic volume switched by the agency to the airline offering the incentive. If the airline flies over a large number of routes, then the travel agent is provided with a larger choice of destinations and it is easier for him/her to have access to the overrides, which is to the advantage of the airline.

The size of an airline's network is also important when it comes to the operation of hub-and-spoke systems. These systems, which appeared following airline deregulation in the US, are characterised by a central airport (the hub) from which routes (the spokes) radiate outwards to a large number of destinations. They replaced the point-to-point linear route network which existed in the US prior to deregulation since linking to a hub could increase the number of city-pairs served dramatically[52]. In addition, the hub-and-spoke system allows the collection of passengers destined to different destinations via the hub on one aircraft. Consequently, a larger aircraft with lower unit operating costs can be used on a spoke, which would have not been possible had the operation been point-to-point. For the hub-and-spoke system to work effectively, the airline needs to serve a large number of destinations from the hub. Therefore, the larger airline in terms of network size is at an advantage relative to its smaller counterpart.

This discussion has shown the importance of network size to the reaping of economies of scope in the contemporary airline industry. However, expanding one's network

[52] For a hub with n spokes, the maximum number of connecting markets and the maximum number of city-pair markets can be mathematically shown to be $n(n-1)/2$ and $n(n+1)/2$ respectively (Doganis, 1991).

organically can be very costly and time-consuming. Alliances enable airlines to bypass organic growth and to effectively complement their networks with those of their partners. Integration of the networks can then enable them to reap the economies of scope resulting from network size and structure.

9.4.3 Market power

Economies of scope and market power are closely related in the sense that production on a large network and the creation of hub-and-spoke systems can create artificial barriers to entry. These barriers are then used to generate economic rents and supranormal profits[53] (Youssef, 1992). Alliances increase the market power of airlines by conferring them a greater 'mass' in a short time, mass being '...a large revenue base diversified by geographic markets....' (Levine, 1987, p. 393). Increased mass can be used to deter predatory practices from a competitor attempting entry as having a large and diversified network allows the alliance to practice cross-subsidisation and to sustain a fare war with the competitor. Levine (1987) identifies potential economies of scope here as the reputation of the alliance as a formidable competitor is communicated throughout its network and deters further entry. The ability of cross-subsidisation is critical when competitive pricing is practised by the alliance to push competitors out of markets and to increase its market share. The prevalence of economies of scope and market power is the principal reason for the failure of the contestability[54] theory put forward by Baumol *et al* (1982) to justify US airline deregulation.

Hubbing creates sources of market power as the airline is able to dominate gates, runway and concourse capacity at the hub and possesses the attractive slots, leaving

[53] Youssef (1992) found no statistical evidence to support his hypothesis of market power as a motivator for alliance formation. However, this could well be the result of the inappropriateness of his measures of market power which were taken to be yield and operating margin. These measures are subject to other important factors, namely discounting which could blur their relationship with market power. A better measure of market power is market share in origin-destination markets which is shown in Chapter 11 to change considerably following alliance formation.

[54] According to the contestability theory, the threat of entry by competitors into airline markets is sufficiently powerful to deter incumbents from exercising market power. For the markets to be contestable, airlines shouldbe able to enter and leave them without incurring losses due to sunk costs. This requires that (1) all factors of production are mobile among markets, (2) consumers are willing and able to switch quickly among suppliers, and (3) existing firms are able to change their prices quickly in response to the entry of a new firm.

little scope for new entry. The lack of attractive slots makes it difficult for the new entrant to compete with the incumbent by using frequency as a competitive tool, and disrupts the new entrant's plans to benefit from the necessary network economies in order to survive. In the US context, Levine (1987, p. 469) observes that incumbents tend to control unused airport assets so as to impede new entry: 'Controlling substantial amounts of unused space can make entry more difficult, expensive and risky by making already-constructed facilities unavailable to the new entrant.' The information costs and economies of scope which stem from size are also inherent in the hubbing technique. This deters market entry even further as the new entrant realises that the incumbent can use these economies in predatory practices.

The fact that the alliance controls the hubs at both ends of the market is a source of market power in the inter-hub market. This follows from the work of Mauldin (1989) who shows that fares in those types of market are significantly higher than those where only one hub is dominated. The KLM-Northwest alliance has exerted considerable market power on the transatlantic routes which it operates. Hanlon (1996) points out that the market shares of KLM and Northwest on transatlantic routes were 3 and 5 per cent respectively prior to alliance formation. Following alliance formation, the combined market share of the two airlines has risen to 12 per cent. The proposed BA-American Airlines alliance is also in a position to exert even higher market power on transatlantic routes considering that it currently will have 60% of the market share.

9.4.4 Economies of density

Economies of density exist when unit costs fall with increasing traffic volume, keeping the network size fixed (Gillen *et al*, 1985). This is different from economies of scale where the network size increases[55]. Youssef (1992) identifies two locations where economies of density can exist: on individual city-pairs (link density) and on

[55] The distinction between economies of density and economies of scale disappears when the focus is on a single route instead of the whole network. Increasing the traffic volume on a single route can lead to the use of a larger aircraft which can be operated at lower unit costs. However, Weisman (1990) argues that the existence of economies of scale in this situation is questionable as a change in technology is required, which leads to a change in the production function. Therefore, such economies are best qualified as economies of density.

the whole airline network (network density). These economies exist for a number of reasons. Firstly, as the traffic volume on an individual route increases, higher load factors are obtained leading to lower unit costs. Secondly, the increased traffic density could require the use of a larger aircraft with can be operated at lower unit costs. Thirdly, increased traffic volume leads to a more efficient utilisation of aircraft and crews. If similar economies arise on all the routes in the network, then economies of network density are reaped. The existence of economies of density in the airline industry has been statistically proven in a number of studies, the most notable ones being those of Caves *et al* (1984) and Bailey *et al* (1985). The existence of economies of density in the airline industry is mathematically demonstrated by the statistically-significant coefficient of load factor in Equations 9.1a and 9.1b.

The practice of hubbing brings about economies of density in two ways. By collecting passengers from the same origin but bound to different destinations onto a single aircraft, the airline is able to increase its frequencies and load factors on the spokes. Doing so also decreases the number of flights required for the carriage of a given number of passengers over a given number of destinations, hence a decrease in unit costs (Hanlon, 1996). The fact that hubbing leads to economies of density has been empirically proven by McShan and Windle (1989) and by Brueckner *et al* (1992).

The prevalence of economies of density in the airline industry is critical to the operation of alliances. Indeed, efficient linking of networks increases the 'effective' network size (Youssef, 1992) of the individual airlines' in the alliance as they are able to offer a larger choice of destinations to consumers. The traffic density on the networks therefore increases while the airlines' actual network size remains constant. Alliances can also enable airlines to reap economies of density by indulging into reciprocal traffic feed. Efficient network connections and the practice of code-sharing increase the attractiveness of the alliance interline connections relative to interline connections of competing carriers and therefore keep passengers on the integrated alliance network. The traffic density on the allies individual networks consequently increase. Traffic feed is the main rationale for the formation of alliances between major long-haul airlines and smaller regional/domestic ones.

9.4.5 Hubbing in the international context

The US experience has shown that the hubbing technique is important in ensuring that network economies are achieved. Indeed, by its ability to concentrate passengers from one origin bound to different destinations, or from a variety of origins to one destination, the hubbing technique allows airlines to benefit from economies of scope and density and also to achieve increased market power. Following airline deregulation in the US in 1978, the importance of hubbing as a survival tool became apparent and airlines rushed to establish hubs at strategically-located major airports to be able to cover the whole nation. (Dempsey and Goetz, 1992).

One of the goals of alliances is to emulate the hubbing technique in the international context to achieve a more extensive global coverage. Hence, airlines have linked their networks with high-frequency inter-hub flights for efficient transfer of passengers from one network to the other. British Airways, for example, has daily flights from London to the US airports from which USAir has an extensive network, namely Baltimore, Boston, Charlotte, Los Angeles, New York JFK, Philadelphia and Pittsburgh. Likewise, KLM has daily flights from Amsterdam to Boston, Detroit and Minneapolis which are Northwest's main hubs. By marketing its partner's destinations as if they were its own, an airline can increase the traffic on its network and therefore reap economies of density. The increase in 'effective' network size also brings in economies of scope.

One of the main problems in practising international hubbing with European and Asian airlines is that airports in those regions are not hubs in the right sense of the word (Jenks, 1990). To qualify as a hub, an airport needs to possess two characteristics. The first one is that the hubbing airline has established a flight structure such that the airport is the hub with spokes radiating from it. Most European and Asian airports have developed in that way mainly because of bilateral restrictions which require national airlines to operate international routes from their main airports (Hanlon, 1996). The second characteristic of authentic hubs is that the hubbing airline schedules its flights from the spokes to arrive at the hub in 'waves', that is having all flights landing at the hub within minutes from each other. In that way, passengers can all transfer to their connecting flights at the hub after which all flights depart to the spoke destinations. Not many European and Asian airports possess this scheduling characteristic. In Europe, the only ones are most probably Brussels and Amsterdam. Connections in the non-authentic hubs occur primarily from the sheer volume of departures and arrivals of the national carrier at the airport (Jenks, 1990). Therefore, in an alliance consisting of a European and a US carrier, a passenger connecting at the European airport could find that he/she has to wait for a long time for his/her onwards flight.

9.5 Conclusion

Alliance success measurement will be based on the degree of goal attainment. The objectives of airline alliances are economies of scale on the supply side, economies of density, economies of scope and market power on the demand side. Economies of scale on the demand side are inexistent both at the airline level and at the alliance level.

For proper and adequate measurement of alliance success, it is necessary to incorporate the airline collaborative strategies identified in Chapter 6 into the alliance goal classification scheme. The result of this integration is given in Figure 9.5. The prevalence of economies of scope and density are analysed in the next chapter.

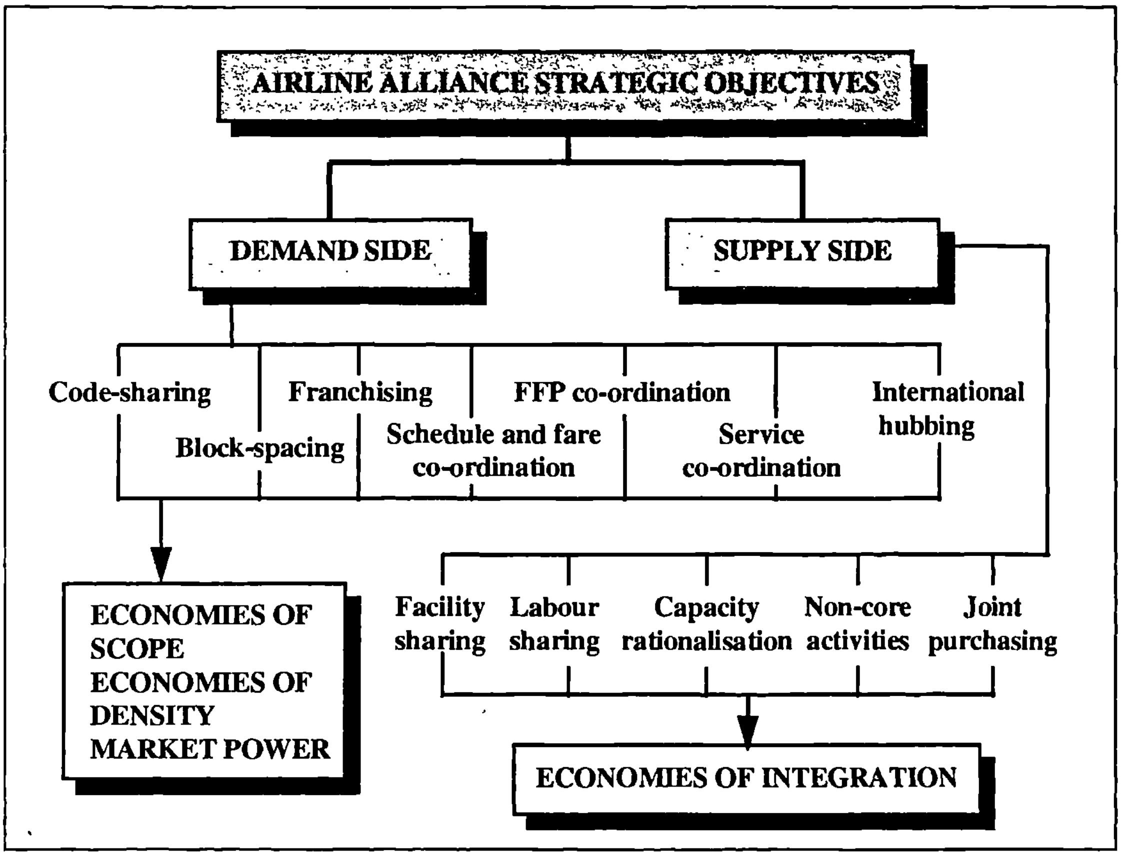


Figure 9.5 Alliance objectives' classification scheme

10. MODELLING SCOPE AND DENSITY ECONOMIES IN AIRLINE ALLIANCES

Introduction

The thesis now proceeds into a mathematical analysis of airline alliances. The objective is to build mathematical models of airline alliance operational performance which will be very important in the identification and evaluation of those factors which contribute in bringing it about. Indeed, these models will provide alliance success and success factor quantification, such quantification being notoriously lacking in research studies on airline alliances. A further use for the models is in the prediction of outcomes when the structure and operations of potential alliances are being investigated into. Hence, the models will provide airline managers with an effective management tool in their decision-making processes when considering alliance formation and analysing prospective partners. Again, such a management tool is lacking in the airline industry where it seems that decisions concerning the workings of alliances are taken in a fashion akin to guesswork.

This aim of this chapter is to build a mathematical model of scope and density economies in airline alliances. Scope economies refer to marketing advantages which result from the size and structure of airlines' networks. Density economies refer to the lower unit costs obtained by increasing the traffic on a fixed-sized network. The chapter is divided into three main parts. The first part describes how airlines have linked their networks to benefit from scope and density economies and develops a methodology to quantify alliance performance in this context. The second part develops the mathematical model of alliance success by identifying those factors which are believed to influence it. Measures for these factors are defined to enable their incorporation in the mathematical model. The third part presents the results of the model calibration and discusses their implications on the structuring of airline alliances.

10.1 Airline Network Integration

In Chapter 9, two main ways by which airlines can use alliances to reap economies of scope and density were identified as market access and traffic feed. Adequate market integration enables airlines to add certain of their partner's destinations to their own network and market them as if they were their own. The greater choice of destinations attracts more traffic onto the airline's network. Traffic feed can also be viewed as some form of market access whereby an airline can have access the traffic in the exclusive markets of its partner without it having to set up its own operations in those particular markets. Furthermore, traffic feed also allows airlines to support a higher level of service which increases the carrier's share of available departures thus attracting more local traffic (Bailey *et al*, 1985).

The extent to which traffic density benefits can be reaped by airlines in an alliance depends greatly on the degree to which their individual networks are integrated together. As in the airline mergers which took place in the US after deregulation, network integration in alliances is effectively achieved by linking the hubs of the partners so as to create an extended network (Oum *et al*, 1993; GRA, 1994). A graphical model of the situation is provided in Figure 10.1. This figure will be the basis of the following discussions and modelling processes.

A passenger from an origin (O) in the network of airline x bound to a destination (D) in the network of airline y is routed via the partners' hubs H_x and H_y. The inter-hub flight H_x–H_y is operated either by the outbound flight of airline x or by the return flight of airline y or both. In many cases, following alliance formation, the inter-hub flights are either operated jointly or code-shared. Incidentally, this 'two-hub' theory has been criticised by Shenton (1994b) who argues that alliances force travellers to make double connections while only one connection was required previously. However, these arguments take a one-sided view of the situation and do not consider

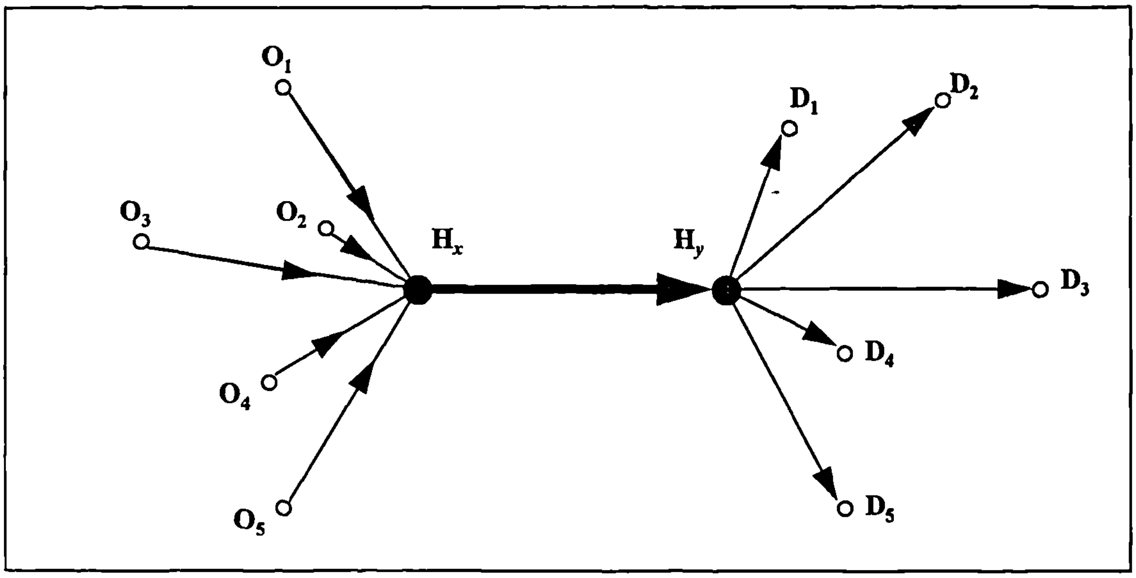


Figure 10.1 Network integration in airline alliances

the additional advantages offered by alliances such as their on-line characteristics, through check-in and shorter layover times. Furthermore, the argument that only one connection was required in the past is not necessarily true. Rather, the passenger travelling from behind-gateway cities in one continent to beyond-gateway cities in another continent was routed through more than one or even two connecting points under the prevailing interlining system.

10.2 Alliance Success Measurement

In the measurement of success, the *alliance* will be the unit of analysis as opposed to the individual airlines which constitute the partnership. The degree of success of the alliance will be quantified as the change in a property of the alliance from a defined pre-alliance period to a defined post-alliance period:

$$alliance\ success = M_{A\ (post-alliance)} - M_{A\ (pre-alliance)} \qquad \textbf{(Eq. 10.1)}$$

where M_A is the alliance property.

From the discussion on network integration, it would appear that the effects of co-operation between airlines x and y will be observed primarily on the inter-hub (H_x–H_y) route. Such effects could be in the form of increased load factors as the airlines stop competing against each other and use only one aircraft instead of two to operate the route. Market presence is maintained by code-sharing or block-spacing. Furthermore, the provision of a greater choice of destinations to consumers at the end points of both networks and at the hubs will stimulate traffic on both the airlines' networks. This will be translated into increased passenger traffic on the inter-hub route and possibly increased load factors provided no aircraft change has occurred. Measures geared towards improving traffic feed will keep passengers connecting at H_x or H_y on the airlines' combined system instead of them interlining with a competing carrier. The effectiveness of those practices will again be reflected in improved alliance traffic on the inter-hub route. Thus, the economies of link density obtained by the alliance on the inter-hub route will reflect the economies of density from which the alliance partners benefit on their respective networks.

From this discussion, it logically follows that the best location to measure alliance success in this context is on the inter-hub route. Possible alliance properties to be monitored are the *alliance load factor* and the *alliance passenger traffic* on that route. The alliance success measures which result are mathematically expressed in Equations 10.2 and 10.3.

$$(\Delta LF_A)_{ij} = \Delta\left[\frac{(HPAX_x + HPAX_y)_{ij}}{(CAP_x + CAP_y)_{ij}}\right] \qquad \textbf{(Eq. 10.2)}$$

$$(\Delta HPAX_A)_{ij} = \Delta\left[(HPAX_x)_{ij} + (HPAX_y)_{ij}\right] \qquad \textbf{(Eq. 10.3)}$$

where

Δ is the change in value from a defined pre-alliance period to a defined post-alliance period;

subscript '*A*' refers to the alliance, subscripts '*x*' and '*y*' refer to the airlines in the alliance, and subscript '*ij*' refers to the inter-hub route from H_x to H_y;

HPAX is the passenger traffic on the inter-hub route; and

CAP is the capacity offered on the inter-hub route.

A major drawback in using alliance inter-hub load factor when measuring its success is that it is highly affected by service frequency. The formation of an alliance is likely to be accompanied by a step increase in service frequency as the partners attempt to integrate their networks and gain market share. However, it is unlikely that passenger traffic will respond to the frequency increase immediately. A more gradual response over a certain period of time is expected. Therefore, the increase in frequency on the route will cause a dip in load factor. This is apparent in Figure 10.2 which shows the variation in load factor and passenger traffic for the KLM-Northwest combination on the Amsterdam-Boston route.

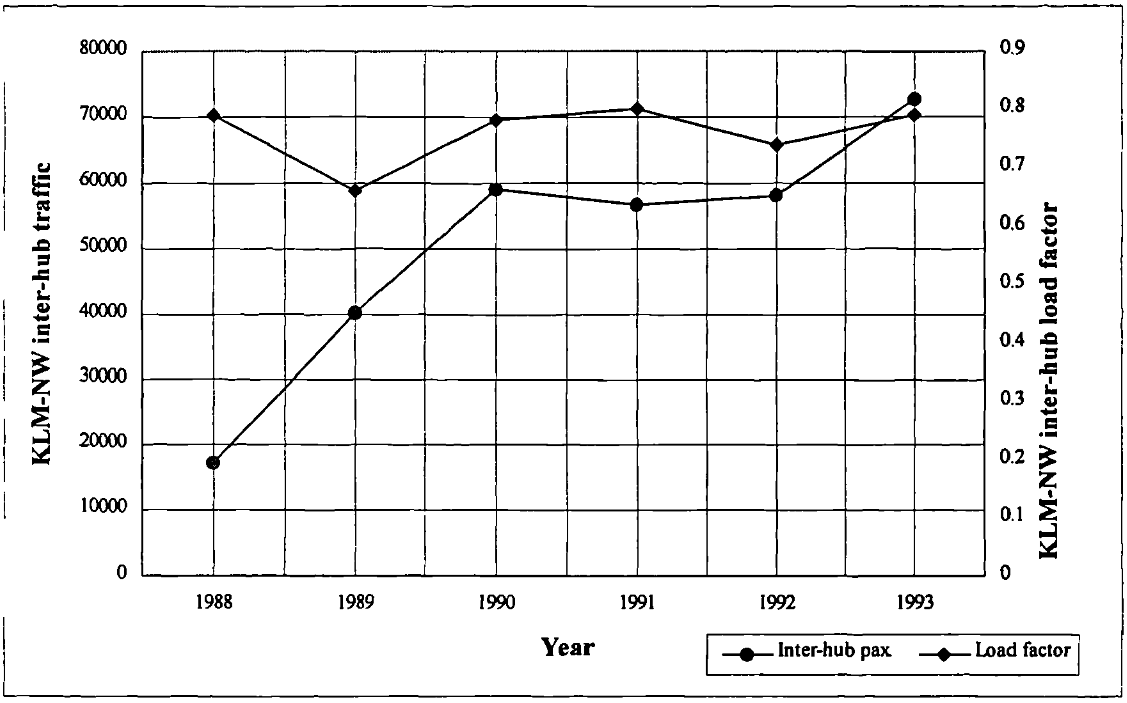


Figure 10.2 Variation in KLM-Northwest load factor and number of passengers carried on the Amsterdam-Boston inter-hub route
Data source: ICAO-Traffic by Flight Stage

From 1988 to 1989, the total number of flights of the KLM-Northwest combination increased by 131 with the same type of aircraft (McDonnell Douglas DC10). The number of passengers carried by the alliance consequently increased. However, the load factor of the alliance fell from 79 per cent to 66 per cent in the same time period. Therefore, owing to the inappropriateness of load factor as a success measure, only alliance inter-hub passenger traffic will be used to quantify alliance success. The airline alliances to which the success measure will be applied are selected in the next section.

10.3 Alliance Selection

One of the criteria for selection of airline alliances to be included in the analysis is the degree of marketing co-operation achieved. Only alliances which are strategic in nature, as defined in Chapter 4, are selected. A second requisite is that the alliances are between carriers of comparable size and scope. Those alliances satisfying these two conditions are the former EQA[56], the Global Excellence, British Airways-USAir, KLM-Northwest Airlines, SAS-Continental Airlines and the alliances of Iberia with Aerolineas Argentinas and Viasa. Franchising and feeder agreements with small domestic and regional airlines are excluded from the sample. The Lufthansa-United Airlines alliance is also excluded since it is very recent and its post-alliance traffic data is not available from the *ICAO* compilation of traffic statistics.

In order to obtain a homogeneous sample of routes, only non-stop inter-hub routes are selected. Therefore, the London-Sydney and Madrid-Santiago inter-hub routes which are served by the British Airways-Qantas and Iberia-Ladeco alliances[57] respectively are not included in the analysis even though these alliances are quite sizeable. Iberia's hub in Miami is also not considered because it is only used as means to route traffic from Madrid into Latin America and vice-versa. Therefore, travellers from Spain are required to stop at Miami and Buenos-Aires/Caracas/Santiago on their way to their destinations (two hub stops). Furthermore, for the sake of homogeneity, the Zurich-Changi route operated by the Swissair-Singapore Airlines alliance is omitted from the sample because it is the only one involving an Asian hub, while all the other hub combinations in the sample involve either European hubs or European and US hubs.

[56] The alliances of Swissair and Austrian Airlines with Sabena are not considered as Sabena replaced SAS only recently. Therefore, the effects of the alliance might not yet be observable.
[57] British Airways flight BA009 from Heathrow to Sydney stops at Bangkok, while Qantas flight QF10 stops at both Singapore and Melbourne on their way to Sydney. Iberia flight IB6811 stops at Rio de Janeiro on its way to Santiago (*ABC World Airways Guide*, September 1995).

The selected inter-hub routes and the change in alliance passenger traffic are given in Table 10.1[58]. The pre-alliance period is taken as 1989 for the EQA, Global Excellence, SAS-Continental and the alliances of Iberia, and as 1991 for KLM-Northwest and British Airways-USAir because they became operational in 1992. The post-alliance period is taken as 1994 as the latest traffic data is for that year. By that time, alliance effects are expected to be observable. Traffic data is obtained from the *ICAO-Traffic by Flight Stage*. In a small number of cases, traffic data for 1989 was not listed in that data source. Alliance inter-hub traffic was then estimated using Equation 10.4:

$$(HPAX_A)_{ij} = \sum_{x,y}\left(F_{ij} \times CAP_{ij} \times LF_r\right) \qquad \textbf{(Eq. 10.4)}$$

where

F_{ij} is the frequency of the airline on inter-hub route ij

CAP_{ij} is the capacity of the aircraft operated by the airline on the inter-hub route, and

LF_r is the average load factor of the airline in the particular region r (transatlantic or European).

H_x	H_y	Alliance	$\Delta HPAX$	$\Delta HPAX$ (%)
CPH	VIE	SK-OS	24097	49.52
VIE	CPH	SK-OS	20886	40.17
ARN	VIE	SK-OS	13415	60.81
VIE	ARN	SK-OS	16975	75.42
GVA	VIE	SR-OS	11685	64.44
VIE	GVA	SR-OS	9929	50.31
ZRH	VIE[1]	SR-OS	62913	65.68
VIE	ZRH	SR-OS	-25259	-16.05
CPH	GVA	SK-SR	23541	81.02
GVA	CPH	SK-SR	18611	64.55
CPH	ZRH	SK-SR	-8695	-10.29
ZRH	CPH	SK-SR	-3706	-4.07
OSL	ZRH	SK-SR	23539	221.77
ZRH	OSL	SK-SR	19536	115.52
ARN	ZRH	SK-SR	-6207	-8.62
ZRH	ARN	SK-SR	-19820	-26.30
ARN	GVA	SK-SR	15892	123.34
GVA	ARN[1]	SK-SR	984	3.76
ATL	ZRH	SR-DL	14766	33.61

Table 10.1 Inter-hub routes selected for analysis

[58] The raw data from which $\Delta HPAX$ and ΔLF are derived is given in Appendix B.

H_x	H_y	Alliance	*ΔHPAX*	*ΔHPAX* (%)
ZRH	ATL	SR-DL	11455	23.74
CVG	ZRH	SR-DL	12573	-
ZRH	CVG	SR-DL	13467	-
CPH	EWR	SK-CO	22985	34.01
EWR	CPH	SK-CO	27197	41.66
OSL	EWR	SK-CO	41594	96.80
EWR	OSL	SK-CO	11463	27.23
ARN	EWR	SK-CO	35479	74.84
EWR	ARN	SK-CO	5726	12.39
BOS	AMS	KL-NW	33451	84.71
AMS	BOS	KL-NW	32538	81.16
DET	AMS[2]	KL-NW	35983	103.62
AMS	DET[2]	KL-NW	44485	128.11
MSP	AMS[3]	KL-NW	33386	96.14
AMS	MSP[3]	KL-NW	34638	99.75
BUE	MAD	IB-AR	38336	64.97
MAD	BUE	IB-AR	42918	92.87
CCS	MAD	IB-VA	10733	20.61
MAD	CCS	IB-VA	14103	18.11
LON	BWI[4]	BA-US	47649	-
BWI	LON[4]	BA-US	47123	-
LON	BOS	BA-US	17488	16.31
BOS	LON	BA-US	19123	18.12
LON	CLT[4]	BA-US	54534	-
CLT	LON[4]	BA-US	56514	-
LON	LAX	BA-US	31550	19.46
LAX	LON	BA-US	34248	21.37
LON	NYC	BA-US	81487	21.66
NYC	LON	BA-US	82013	23.57
LON	PHL	BA-US	68021	132.99
PHL	LON	BA-US	70465	158.20
LON	PIT[4]	BA-US	17858	-
PIT	LON	BA-US	25729	-

Table 10.1 *(Cont'd)*

Key: AMS: Amsterdam; ARN: Stockholm (Arlanda); ATL: Atlanta; BOS: Boston; BWI: Baltimore; BUE: Buenos Aires; CCS: Caracas; CPH: Copenhagen; CLT: Charlotte; CVG: Cincinnati; DET: Detroit; FRA: Frankfurt; GVA: Geneva; EWR: New York (Newark); IAD: Washington (Dulles); LAX: Los Angeles; LON: London; MAD: Madrid; MSP: Minneapolis; NYC: New York; ORD: Chicago (O'Hare); OSL: Oslo; PHL: Philadelphia; PIT: Pittsburgh; SFO: San Francisco; VIE: Vienna; ZRH: Zurich

Notes

[1] 1989 traffic data estimated using airlines' average European load factor obtained from AEA 1990 Yearbook-Statistical Appendices

[2] 1989 traffic data estimated using KLM's average transatlantic load factor obtained from AEA 1990 Yearbook-Statistical Appendices

[3] 1989 traffic data estimated using Northwest's average transatlantic data obtained from Air Transport World, December 1989

[4] 1989 traffic data estimated using British Airways' average transatlantic load factor obtained from AEA 1990 Yearbook-Statistical Appendices

- Routes not operated by the airlines in the alliance in the pre-alliance period

10.4 Isolation Of Alliance Effects

Having defined a measure of alliance success, it is essential to recognise that passenger traffic on the inter-hub routes is influenced by a series of other factors other than close co-operation between alliance partners. The main factors affecting the alliance's inter-hub traffic can be identified as Gross Domestic Product (GDP) and population in the country of origin, the fares offered on the inter-hub route or in through markets via the hubs, alliance service frequency, the airline/alliance quality of service, and the level of competition experienced by the alliance. How those variables affect demand for air travel is briefly described below.

10.4.1 Determinants of demand

As the GDP of the home countries of airlines increases, people tend to have more disposable income which can be spent on air travel, hence an increase in passenger traffic. GDP is also an indicator of the level of a country's economic activity which generates demand for air travel (Kanafani, 1983). An increase in population can also lead to increased passenger traffic. However, this might not always be the case, particularly in Third World countries where a large proportion of the population can not afford air travel.

Low fares offered on selected routes in the airlines' networks are likely to stimulate demand particularly in the leisure market, and thus increase passenger traffic on the inter-hub route. Increases in service frequency can increase the market share of the alliance relative to that of its competitors as conceptualised in the generally-accepted *S*-curve variation of market share with frequency[59] (see Taneja, 1981). Increased service frequency can also stimulate traffic as more flights are offered at convenient times. However, they can lead to drops in load factors as was observed previously. It is recognised that the relationship between demand and frequency is two-way. Increases in frequency can stimulate demand as explained above. However, increased demand

[59] The *S*-curve variation of market share with service frequency is discussed in depth in Chapter 11.

(resulting from an increase in GDP) can lead airlines to increase frequency to accommodate the higher number of passengers.

Improvements in airline in-flight service quality can enable the airline to divert passengers from its competitors, provided the improvements are not accompanied by large fare rises. Finally, changes in the level of competition can affect the number of consumers travelling with the alliance as a high competition means that traffic has to be divided among a large number of competitors. The quality of the competition in terms of frequency and in-flight service also affects the market share of the airline. This list of variables affecting demand is not exhaustive. However, they explain most of the variation in demand on a route.

Some of the variables affecting demand will be related to alliance formation while others will not. The variables which are totally independent of alliance formation include GDP and population. The other factors are related to various degrees to the alliance formation. For example, service frequency on the inter-hub route can change dramatically following the formation of the airline alliance. This is apparent in Figure 10.3 which gives the total weekly frequencies[60] on the inter-hub routes of the EQA immediately before and after its formation.

Fare levels are also related to alliance formation. In an analysis of the fare levels in markets originating from the EQA hub cities, Youssef (1992) found that fares in those markets had increased more than fares in other non-alliance markets in the same region. At an aggregate level, he found that the fares in alliance markets increased by an average of about 1.5% over those in non-alliance markets from 1989 to 1991. The fare increases were attributed partly to increases in market concentration in the favour of the EQA (Youssef and Hansen, 1994). The change in market concentration as a result of alliance formation shows that the alliance can effectively decrease the level of competition it experiences in certain markets. Youssef (1992) found that the EQA inter-hub markets effectively became monopolies of the alliance after its formation[61].

[60] Data is for the last week of June.
[61] Fifth-Freedom service provided by Thai and Alitalia in the Copenhagen-Zurich market was terminated in 1991.

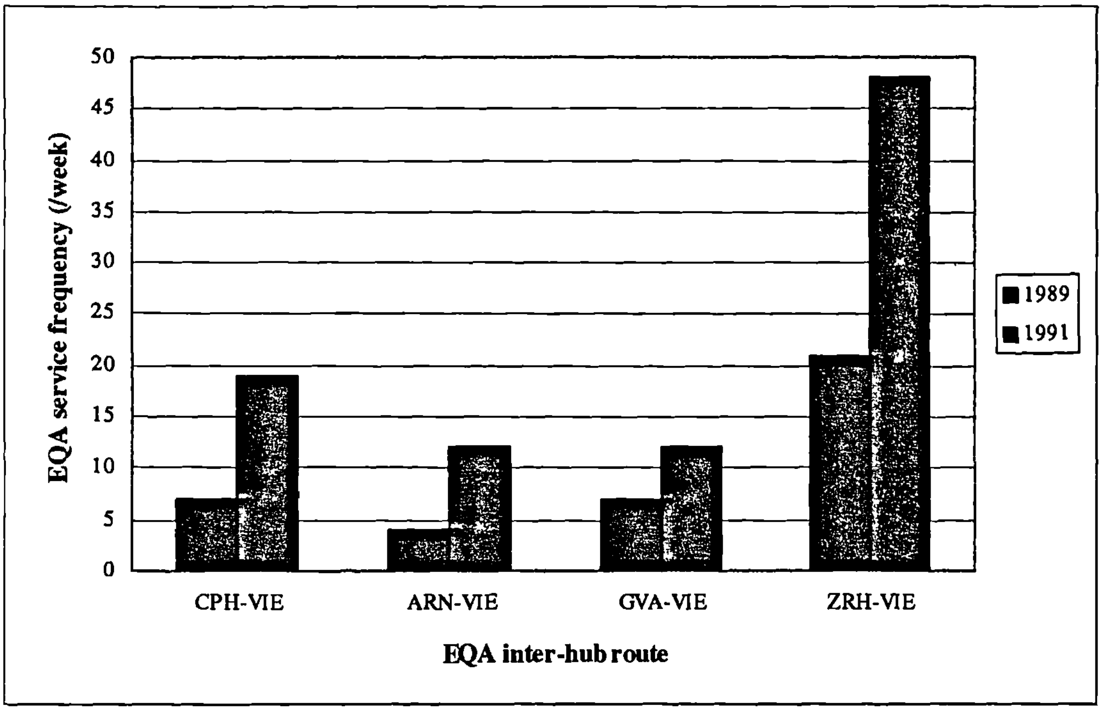


Figure 10.3 Service frequency changes in EQA inter-hub routes after alliance formation
Data source: ABC World Airways Guide, June 1989 and June 1991
(ARN: Arlanda, Stockholm; CPH: Copenhagen; GVA: Geneva; VIE: Vienna; ZRH: Zurich)

The effect of the EQA extended to its O-D markets where the average number of carriers decreased from 5.6 to 5.3.

The extent to which airline alliances affect the quality of in-flight service is less defined, though it can be argued that a relationship does exist between the two. For example, the pressures towards offering seamless travel can lead airline partners to bring their in-flight service to higher standards. This is exemplified by the KLM-Northwest alliance whereby both airlines have redefined their business-class product and brought it up to identical quality levels. The other side of the coin is when the alliance results in the formation of a monopoly on the inter-hub route. Incentive then exists to bring service levels down to decrease costs as the airlines realise that the consumer has no other choice than to fly with them.

It is recognised that changes in the fares, service frequency, service quality and level of competition are not exclusively the result of alliance formation. They can be affected by other competitive and cost-reduction pressures. This gives rise to a major problem when it comes to disentangling the alliance and non-alliance effects.

However, from the above discussion and Youssef's case study of the EQA, one can argue that alliance effects are very predominant on inter-hub routes. The analysis will therefore be pursued on the assumption that GDP and population are the only non-alliance variables which have to be controlled for. In brief, inter-hub passenger levels of the alliance can, to a certain extent, be modelled by Equation 10.5.

$$HPAX_A = f(GDP, POP, alliance) \qquad \textbf{(Eq. 10.5)}$$

where

$HPAX_A$ is the alliance passenger traffic between the hubs,

GDP is the Gross Domestic Product of the country of origin,

POP is the population in the country of origin, and

alliance represents a vector of those variables directly affected by the formation of the alliance, that is fare, service frequency, level of competition and level of in-flight service.

How to separate the effects of alliance formation from the overall traffic results of the allied airlines is considered next.

10.4.2 Separating alliance and non-alliance effects

10.4.2.1 Methodology

The main difficulty in determining the impact of alliance formation on inter-hub traffic is to predict the change in traffic had the alliance not been formed in the first place. The methodology devised to overcome that problem is based on the elasticities of alliance inter-hub passenger levels with respect to GDP and population. It is best explained with reference to Figure 10.4 which considers inter-hub traffic to vary only with GDP for simplicity purposes.

Let the alliance inter-hub passenger traffic vary with GDP according to Equation 10.6.

$$Ln(HPAX_A) = a_0 + a_1 Ln(GDP) \qquad \textbf{(Eq. 10.6)}$$

The coefficient a_1 can be determined by a time-series linear regression and represents the elasticity of traffic with respect to GDP.

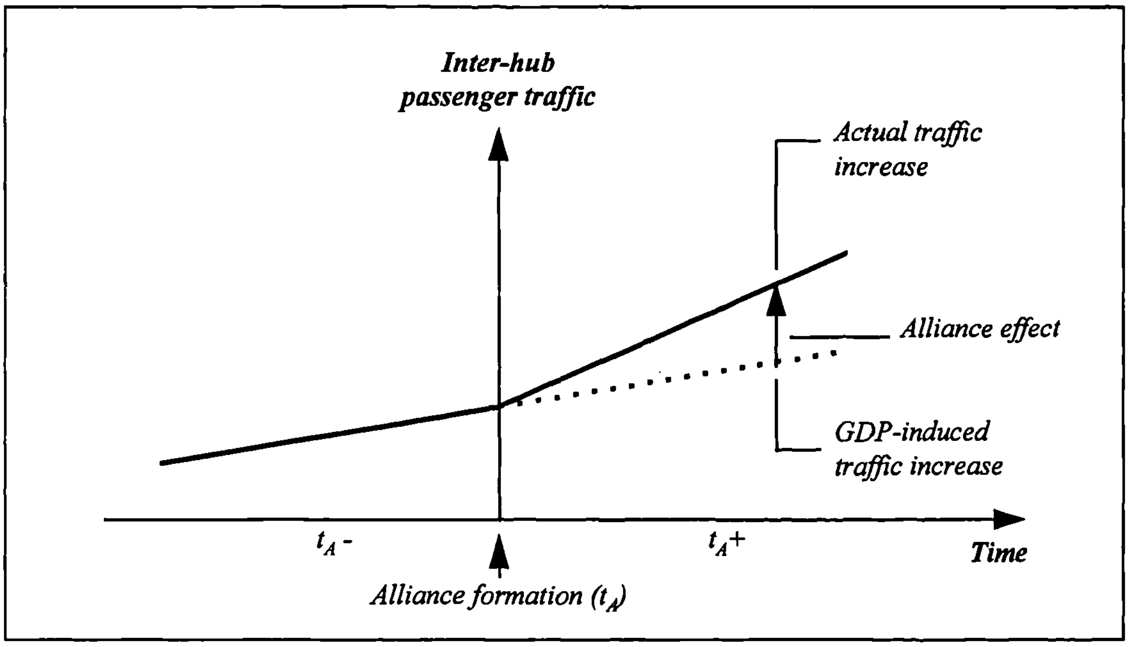


Figure 10.4 Isolation of alliance effects

This variation of inter-hub traffic with GDP can be assumed to be valid after the alliance was formed as shown by the dashed line in Figure 10.4. This assumption holds because GDP is completely independent of alliance formation. Since, by definition, elasticities are percentage changes when variables are regressed in logarithmic form (ICAO, 1985), then Equation 10.6 can be re-written as follows

$$d(HPAX_A) = a_1 d(GDP) \qquad \textbf{(Eq. 10.7)}$$

where *d* refers to percentage changes.

If from time t_A- (pre-alliance) to time t_A+ (post-alliance), the GDP changes by p%, it follows from Equation 10.7 that the GDP-induced change in traffic will be a_1p%. If it is known that the actual percentage change in traffic from time t_A- to time t_A+ is q%, then the percentage change in traffic brought about by the alliance can be approximated to $(q-a_1p)$%, that is the difference between the dashed and solid lines in Figure 10.4. An approximate value of the absolute change in traffic as a result of the alliance is then given by $\frac{r(q-a_1p)}{100}$ where r is the amount of passenger traffic at t_A-.

A worked example is given next to illustrate how the methodology is applied to isolate the effects of the alliance.

10.4.2.2 Worked example

Let the variation in the number of passengers carried by the British Airways-USAir alliance on the London→Los Angeles sector be described by Equation 10.8a below[62].

$$Ln(HPAX_{BA/US}) = 1.418Ln(GDP) + 0.754Ln(CAP) - 15.122 \qquad \textbf{(Eq. 10.8a)}$$

where *CAP* is the alliance yearly capacity on the route. Service frequency is replaced by capacity for reasons given in section 10.4.2.3.

The elasticity of demand (E_{GDP}) with respect to *GDP* is therefore 1.418.

From the pre-alliance period (1991) to the post-alliance period (1994), the total number of passengers carried by the British Airways-USAir combination from London to Los Angeles increased from 162,152 to 193,702. The percentage change in total traffic on the route is then

$$(\Delta HPAX_T)_{\%} = \left(\frac{193{,}702 - 162{,}152}{162{,}152}\right) \times 100 = 19.46\% \qquad \textbf{(Eq. 10.8b)}$$

In that period, GDP changed from \$926,506.0 mn. to \$844,663.7 mn., that is

$$(\Delta GDP)_{\%} = \left(\frac{844{,}663.7 - 926{,}506.0}{926{,}506.0}\right) \times 100 = -8.83\% \qquad \textbf{(Eq. 10.8c)}$$

The percentage change in traffic resulting from the increase in *GDP* is then given by

$$(\Delta HPAX_{GDP})_{\%} = E_{GDP} \times (\Delta GDP)_{\%} = 1.418 \times (-8.83) = -12.52\% \qquad \textbf{(Eq. 10.8d)}$$

The percentage increase in traffic caused by the alliance from 1991 to 1994 can therefore be approximated to

$$(\Delta HPAX_{BA/US})_{\%} = (\Delta HPAX_T)_{\%} - (\Delta HPAX_{GDP})_{\%} = 19.46 - (-12.52) = 31.98\%$$

(Eq. 10.8e)

From Equation 10.8e, it follows that the absolute change in traffic brought about by the alliance strategies is approximately

[62] How this equation is arrived at is shown in sections 10.4.2.3 and 10.4.2.4.

$$\Delta HPAX_{BA/US} = \frac{(\Delta HPAX_{BA/US})_{\%}}{100} \times HPAX_{1991} = \frac{31.98}{100} \times 162{,}152 \approx \mathbf{51856}$$

(Eq. 10.8f)

10.4.2.3 Model specification

This section describes how the general model of inter-hub passenger traffic given in Equation 10.5 is specified to prepare it for accurate calibration. As a reminder, Equation 10.5 explains the variation in alliance inter-hub traffic by changes in GDP, population and alliance-related factors. The elasticities of demand with respect to the variables for each of the selected inter-hub routes can be determined by a time-series regression. For an accurate estimation of the coefficients of *GDP* and *POP*, it is necessary to perform the time-series regression on a sufficiently-long time span. Yearly data is used with the period of analysis spanning a ten-year period ranging from 1983 to 1992. Since the Gulf War and a global recession took place in that period, it is important to account for those occurrences for they were responsible for dramatic falls in traffic levels in certain years. Inclusion of the war and the recession will improve the accuracy of the *GDP* coefficient. This is achieved by dummy variables taking the value of one for those years which experienced the Gulf War and/or the recession, and a value of zero otherwise. Equation 10.5 can therefore be reformulated as follows:

$$HPAX_A = f(GDP,\ POP,\ alliance,\ RECESSION,\ WAR) \qquad \textbf{(Eq. 10.9)}$$

where *RECESSION* and *WAR* are the dummy variables for those occurrences.

A multiplicative model of alliance inter-hub traffic taking the following form is proposed:

$$HPAX_A = x_0 e^{[x_1(RECESSION)+x_2(WAR)+x_3(LCOM)]}(GDP)^{x_4}(FARE)^{x_5}(CAP)^{x_6}(POP)^{x_7}$$

(Eq. 10.10)

where

FARE is the alliance fare level in constant US dollars on the inter-hub route. The only source of fare data is the *ABC World Airways Guide*. Owing to the different restrictions which are attached to the fares listed in this source, the *Y* (lowest unrestricted economy class) one-way fare is selected

CAP is the capacity provided by the alliance as given by the sum of the capacities of the partners. Capacity is used instead of service frequency because the total number of seats provided airlines over the years is listed in the *ICAO-Traffic by Flight Stage*. Frequency, on the other hand, is only listed per week in the *ABC World Airways Guide*. Replacing service frequency by capacity can be justified considering the fact that aircraft size is optimised for the routes where they are operated. It is therefore highly unlikely for aircraft size and type used over the inter-hub routes to change dramatically over time so that any changes in capacity must necessarily result from frequency changes

LCOM is the level of competition experienced by the alliance on the inter-hub route as given by the number of 'effective' competitors to the alliance. The 'effective' competitors are defined as those which provided a number of seats comparable to that of the alliance in the year being considered. The *LCOM* variable forms part of the exponential term as it takes a value of zero when the alliance experiences no competition.

The relationship between traffic and the factors which explain its variation is assumed to be multiplicative so that the coefficients can be interpreted as elasticities. One problem which was encountered when running the regressions was a high correlation between the *POP* variable and a number of other variables in the model, namely *GDP*[63]. In many cases, this caused the coefficient of the *GDP* variable to be negative. The *POP* variable was consequently discarded from the model. This was observed to have no significant effect on the model's explanatory power for most of the inter-hub routes.

Data for *GDP* is obtained from the *European and International Marketing Data and Statistics* compiled by Euromoney Plc. Both *FARE* and *GDP* are deflated to 1980

[63] Collinearity problems are often encountered with population in time-series regressions because it varies smoothly with time (Kanafani, 1983)

values using Consumer Price Indices (CPI) which are available from the same data source as *GDP*.

Taking logarithms to base '*e*' on both sides of the Equation 10.10 gives Equation 10.11 which was subjected to a stepwise[64] linear regression using the SPSS software package, Version 6.0 for Windows.

$$Ln(HPAX_A) = x_0 + x_1(RECESSION) + x_2(WAR) + x_3(LCOM) + x_4 Ln(GDP) + x_5 Ln(FARE) + x_6 Ln(CAP) \quad \textbf{(Eq. 10.11)}$$

Data for the selected inter-hub routes is given in Appendix C.

10.4.2.4 Results

The results of the linear regressions are given in Table 10.2. Overall, the models are very satisfactory, all having high explanatory powers. The problem of autocorrelation was not serious in the models with Durbin-Watson statistics ranging from 1.3 to 2.7. The independent variables are therefore appropriate in explaining the variation of alliance inter-hub traffic levels. The only exceptions are Vienna-Zurich ($\overline{R^2}$ = 57%), Copenhagen-Geneva ($\overline{R^2}$ = 66%), Boston-London ($\overline{R^2}$ = 66%) and Pittsburgh-London ($\overline{R^2}$ = 43%). One probable explanation for the low explanatory power of those models could be the small number of data points upon which the regressions were based. The models also had high *F*-statistics ascertaining their validity. Variables had high *t*-statistics implying that the probability of them actually being zero is minimal.

In 11 cases, *GDP* is significant in explaining the variation in inter-hub passenger numbers, indicating that these markets have not yet reached maturity. These routes all originated from Europe (Vienna, Stockholm, Copenhagen, Madrid, and London). In one case (Vienna-Geneva), *GDP* is the only variable on which alliance inter-hub

[64] The stepwise regression method involves the sequential computation of a series of regression equations. At each step, an independent variable is added to the equation and others are removed until the explanatory power of the equation does not improve significantly. The criterion for entering and removing an independent variable in the SPSS software package is based on the *F* statistic. Independent variables producing *F* values less than 1.0 are removed from the equation and those with *F* values exceeding 1.5 are entered into the equation.

traffic depends. All US-originating routes are independent of *GDP*, which leads to the conclusion that nearly all the US population is capable of purchasing a ticket for overseas travel. The elasticity of traffic to *GDP* varies between 0.5 and 2, with an extreme value of 3.15 obtained for the Stockholm-Vienna market. The values for the *GDP* coefficients are satisfactory considering that Wheatcroft (1994) obtained a value of approximately 2 for the income elasticity of demand for international air travel. The high value obtained for the Stockholm-Vienna market comes from a high degree of multicollinearity in the model.

H_x	H_y	NETWORK TRAFFIC TRANSFER MODEL	R^2	F
SAS-Austrian Airlines				
Copenhagen	Vienna	*Ln(HPAX) = 0.713 Ln(CAP)* *(6.089)*	0.800	37.08
Vienna	Copenhagen	*Ln(HPAX) = 0.606 Ln(GDP) + 0.397 Ln(CAP) - 0.144 (WAR)* *(4.315) (2.925) (-3.318)*	0.874	21.89
Stockholm	Vienna	*Ln(HPAX) = 3.151 Ln(GDP) + 0.462 Ln(CAP) - 2.789e-4 (LCOM) -0.153 (RECESSION) - 39.590* *(17.354) (13.199) (-2.897) (-4.275) (-17.202)*	0.999	2168.29
Vienna	Stockholm	*Ln(HPAX) = 1.113 Ln(GDP) + 0.284 Ln(CAP) - 0.291 (RECESSION) - 0.312 (WAR)* *(3.016) (6.079) (-3.258) (-4.540)*	0.979	106.08
Swissair-Austrian Airlines				
Geneva	Vienna	*Ln(HPAX) = 0.668 Ln(CAP) + 2.579* *(5.847) (2.106)*	0.787	34.19
Zurich	Vienna	*Ln(HPAX) = 1.152 Ln(CAP) -2.555* *(15.522) (-2.775)*	0.964	240.93
Vienna	Geneva	*Ln(HPAX) = 1.340Ln(GDP) -8.954* *(5.743) (-2.744)*	0.780	32.99
Vienna	Zurich	*Ln(HPAX) = 0.758 Ln(CAP)* *(3.560)*	0.565	12.67
SAS-Swissair				
Copenhagen	Geneva	*Ln(HPAX) = -1.190 Ln(FARE) -0.126 (RECESSION)* *(3.186) (-1.939)*	0.662	9.794
Copenhagen	Zurich	*Ln(HPAX) = 0.890 Ln(GDP) + 0.694 Ln(CAP) + 0.027 (LCOM) - 0.080 (RECESSION)* *(13.138) (17.153) (10.297) (-13.599)* *- 0.117 (WAR) - 11.913* *(-15.583)(-7.867)*	0.993	174.49
Oslo	Zurich	*Ln(HPAX) = 1.243 Ln(CAP)* *(8.733)*	0.950	76.27

Table 10.2 Models of network traffic transfer
(t-statistics in parentheses; t-statistics are significant to the 5% level and F-statistics are significant to the 1% level)

H_x	H_y	NETWORK TRAFFIC TRANSFER MODEL	R^2	F
SAS-Swissair (cont'd)				
Stockholm	Zurich	*Ln(HPAX) = 1.150 Ln(CAP) - 0.469 (RECESSION) - 2.232* *(20.903) (-5.858) (-3.638)*	0.870	16.018
Stockholm	Geneva	*Ln(HPAX) = 0.964 Ln(CAP)* *(47.591)*	0.999	2264.90
Geneva	Copenhagen	*Ln(HPAX) = 1.020 Ln(CAP)* *(9.704)*	0.912	94.17
Geneva	Stockholm	*Ln(HPAX) = 0.938 Ln(CAP)* *(6.506)*	0.912	42.33
Zurich	Copenhagen	*Ln(HPAX) = 0.639 Ln(CAP) - 3.00 Ln(FARE) - 0.192 (WAR) - 16.670* *(7.421) (-3.572) (-2.570) (-3.080)*	0.917	34.19
Zurich	Oslo	*Ln(HPAX) = 0.603 Ln(CAP) - 0.656 (RECESSION) + 3.055* *(16.320) (-31.212) (7.704)*	0.998	951.57
Zurich	Stockholm	*Ln(HPAX) = 1.240 Ln(CAP) - 0.476 (RECESSION) - 3.281* *(21.148) (-6.497) (-4.994)*	0.980	226.04
Swissair-Delta Airlines				
Atlanta	Zurich	*Ln(HPAX) = 1.268 Ln(CAP) - 3.545* *(13.539) (-3.397)*	0.973	183.31
Cincinnati	Zurich	*As for Atlanta-Zurich*		
Zurich	Atlanta	*Ln(HPAX) = 0.802 Ln(CAP) - 0.333 Ln(FARE) + 4.379* *(14.074) (-7.418) (4.547)*	0.997	916.87
Zurich	Cincinnati	*As for Zurich-Atlanta*		
SAS-Continental Airlines				
Copenhagen	New York	*Ln(HPAX) = 0.834 Ln(CAP)* *(9.438)*	0.907	89.09
Oslo	New York	*Ln(HPAX) = 0.951 Ln(CAP)* *(6.698)*	0.846	44.86

Table 10.2 ***(cont'd)***

H_x	H_y	NETWORK TRAFFIC TRANSFER MODEL	R^2	F
SAS-Continental Airlines (cont'd)				
Stockholm	New York	*Ln(HPAX) = 0.914 Ln(CAP)* *(20.041)*	0.980	401.65
New York	Copenhagen	*Ln(HPAX) = 0.783 Ln(CAP) + 2.216* *(9.908) (2.437)*	0.916	98.18
New York	Oslo	*Ln(HPAX) = 0.968 Ln(CAP)* *(5.275)*	0.770	27.83
New York	Stockholm	*Ln(HPAX) = 0.913 Ln(CAP) + 0.598* *(31.844) (1.950)*	0.991	1014.04
KLM-Northwest Airlines				
Boston	Amsterdam	*Ln(HPAX) = 0.833 Ln(CAP) - 0.200 (RECESSION) + 1.398* *(24.796) (-6.090) (3.956)*	0.998	943.57
Detroit	Amsterdam	*As for Boston-Amsterdam*		
Minneapolis	Amsterdam	*As for Boston-Amsterdam*		
Amsterdam	Boston	*Ln(HPAX) = 0.822 Ln(CAP) - 0.199 (RECESSION) + 1.537* *(21.578) (-5.335) (3.835)*	0.997	721.70
Amsterdam	Detroit	*As for Amsterdam-Boston*		
Amsterdam	Minneapolis	*As for Amsterdam-Boston*		
Iberia-Aerolineas Argentinas				
B. Aires	Madrid	*Ln(HPAX) = 0.927 Ln(CAP)* *(5.844)*	0.806	34.15
Madrid	B. Aires	*Ln(HPAX) = 0.800 Ln(GDP) + 0.831 Ln(CAP)* *(2.206) (10.710)*	0.937	67.34
Iberia-Viasa				
Caracas	Madrid	*Ln(HPAX) = 0.909 Ln(CAP) - 0.046 Ln(FARE)* *(13.002) (-2.184)*	0.957	100.24

Table 10.2 (*cont'd*)

H_x	H_y	NETWORK TRAFFIC TRANSFER MODEL	R^2	F
Iberia-Viasa (cont'd)				
Madrid	Caracas	*Ln(HPAX) = 1.016 Ln(CAP)* *(9.614)*	0.910	92.43
British Airways-USAir				
London	Baltimore	*Ln(HPAX) = 0.932 Ln(CAP)* *(6.541)*	0.933	42.79
London	Boston	*Ln(HPAX) = 0.414 Ln(GDP) + 0.868 Ln(CAP)* *(2.310) (3.454)*	0.763	15.45
London	Charlotte			
London	Los Angeles	*Ln(HPAX) = 1.418 Ln(GDP) + 0.754 Ln(CAP) -15.122* *(2.338) (4.297) (-2.675)*	0.977	188.65
London	New York	*Ln(HPAX) = 0.362 Ln(GDP) + 0.899 Ln(CAP) - 3.554* *(2.117) (10.946) (-2.670)*	0.986	319.12
London	Philadelphia	*Ln(HPAX) = 1.792 Ln(GDP) + 1.018 Ln(CAP) - 0.202 (RECESSION) - 22.898* *(3.400) (36.882) (-2.483) (-3.575)*	0.997	1152.41
London	Pittsburgh			
Baltimore	London	*Ln(HPAX) = 0.922 Ln(CAP)* *(10.000)*	0.971	99.99
Boston	London	*Ln(HPAX) = 0.794 Ln(CAP)* *(2.894)*	0.660	9.74
Charlotte	London			
Los Angeles	London	*Ln(HPAX) = 1.178 Ln(CAP) - 2.476* *(15.231) (-2.662)*	0.963	231.98
New York	London	*Ln(HPAX) = 1.070 Ln(CAP)* *(16.192)*	0.970	262.20
Philadelphia	London	*Ln(HPAX) = 1.864 Ln(GDP) + 0.945 Ln(CAP) - 27.794* *(2.808) (23.365) (-2.900)*	0.997	1474.31
Pittsburgh	London	*Ln(HPAX) = 1.008 Ln(CAP)* *(2.180)*	0.429	4.75

Table 10.2 ***(cont'd)***

The capacity provided by the alliances on the inter-hub routes is present in nearly all the models. In 23 of the models, it is the only variable explaining the variation in alliance passenger traffic. This indicates that any changes in frequency made by the alliance is very likely to affect the traffic it carries, and therefore the network economies which might result. In a number of routes, the coefficient of *Ln(CAP)* is observed to be greater than unity. This effectively means that changes in alliance capacity result in a greater-than-proportional increase in traffic.

The coefficients for fare and level of competition both have the expected negative sign. However, the *FARE* variable does not appear in many of the regressions. One possible reason is that the fares listed in the *ABC World Airways Guide* are not the actual fares which passengers are required to pay owing to the widespread practice of discounting. Another probable reason why fares are absent from the models is because hubs are mostly used as points of transfer. Fares are therefore from origin to destination, and bear little relationship with fares charged between hubs. Level of competition is also absent from many of the models. This is because competition on inter-hub routes is minimal since it is operated mainly by the carriers designated under the bilateral agreement between the countries in which the hubs are located. In the intra-European context, the designated carriers are the alliance airlines themselves. The only carriers capable of providing competition to the alliance are those which possess Fifth Freedom traffic rights, and these are very few. Moreover, for many inter-hub routes, the carriers competing with the alliance did not offer capacity comparable to the alliance so that they did not qualify as 'effective' competitors and therefore were not included in the analysis. Competition is rather felt in O-D markets.

The coefficients for *WAR* and *RECESSION* have the expected negative sign in all the models where they appear. Since these variables are dummies, it is difficult to interpret their meaning except that it is evident that they caused decreases in inter-hub traffic. The *WAR* variable is observed to appear only in the models for intra-European traffic levels, while the *RECESSION* variable appears in both intra-European and transatlantic models. The *RECESSION* variable, however, had to be omitted from many of the EQA regressions since it was sometimes highly correlated to capacity.

This is because the recession occurred in the period 1990 to 1992, which is when the EQA became fully operational and implemented capacity increases on the inter-hub routes.

10.4.2.5 Removal of GDP effects

Having been able to present the variation in alliance inter-hub traffic in a way which allows an approximation to the alliance effects, the next stage is to remove the effects of *GDP*. Of the routes affected by *GDP*, the variation in alliance traffic on the Vienna-Geneva route is observed to depend exclusively on that variable, implying that it was unaffected by alliance formation. This route is subsequently discarded from the sample. This leaves ten routes whose alliance inter-hub traffic was affected by both alliance and non-alliance factors. The rest of the routes in the sample are not affected by *GDP* leading one to conclude that the only changes in traffic are mainly a consequence of alliance strategies. Table 10.3 gives the routes which required the application of the methodology developed in section 10.4.2.1.

H_x	H_y	E_{GDP}	$\Delta HPAX_T$ (%)	ΔGDP (%)	$\Delta HPAX_{GDP}$ (%)	$\Delta HPAX_{Alliance}$ (%)	$\Delta HPAX_{Alliance}$ (number)
VIE	CPH	0.606	40.17	20.12	12.19	27.98	14548
ARN	VIE	3.151	60.81	-26.7	-84.13	144.94	31976
CPH	ZRH	0.890	-10.29	15.39	13.70	-23.99	-20263
MAD	BUE	0.800	92.87	0.47	0.38	92.49	42746
FRA	ORD	0.162	104.4	43.06	6.98	97.42	65623
LGW	BOS	0.414	16.31	-9.69	-4.01	20.32	21785
LGW	LAX	1.418	19.46	-9.69	-13.74	33.20	53835
LGW	NYC	0.362	21.66	-9.69	-3.51	25.17	94702
LGW	PHL	1.792	132.99	-9.69	-17.36	150.35	76900
PHL	LGW	1.864	158.21	3.53	6.58	151.63	67536

Table 10.3 Isolation of alliance effects on inter-hub traffic flows.

Using data from Tables 10.1 and 10.3, the average percentage change in inter-hub traffic caused by alliance formation for the selected airline alliances is computed. Comparison of results between alliances is possible in Figure 10.5.

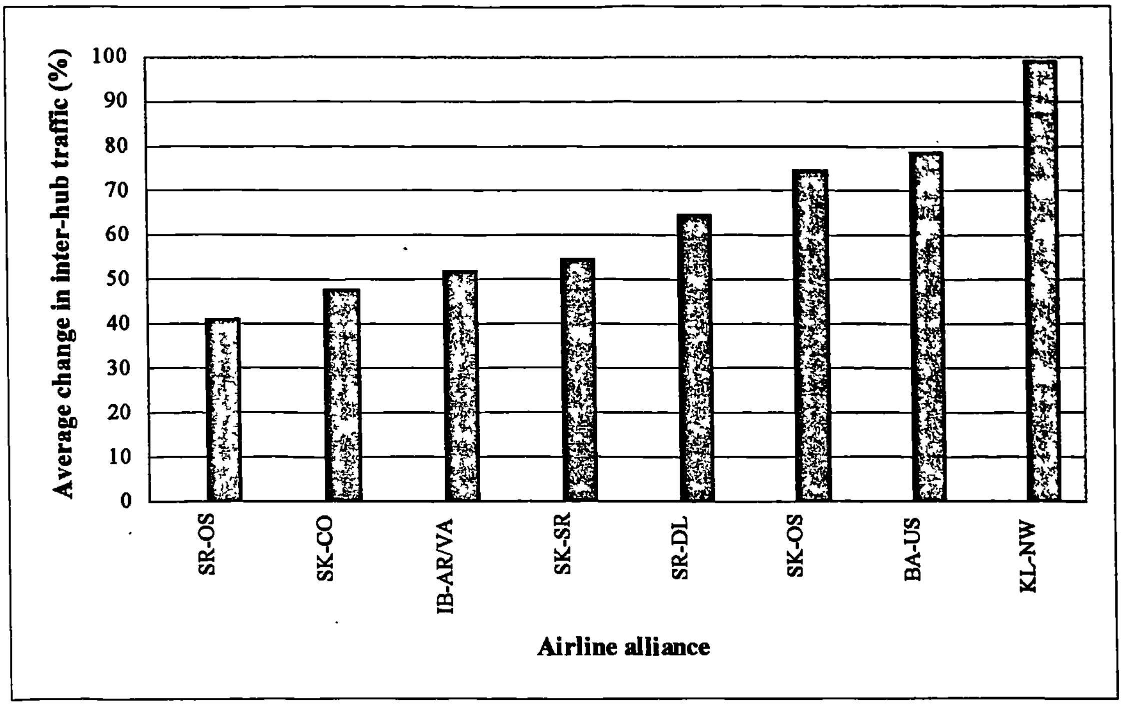


Figure 10.5 Average percentage change in inter-hub traffic for the alliances in the sample

One can observe that the two major transatlantic alliances, British Airways-USAir (BA-US), and KLM-Northwest (KL-NW), are the most effective ones in that they caused the highest changes in inter-hub traffic. The other transatlantic alliances, Swissair-Delta Airlines (SR-DL) and SAS-Continental Airlines (SK-CO) are however not so effective. The fact that BA-US and KL-NW are combining their activities to a much greater extent than SR-DL and SK-CO, and make extensive use of beyond gateway code-sharing can be a possible reason why they are performing better[65]. Antitrust immunity and the longer period of time for which it was in existence can explain why the KLM-Northwest alliance outperforms the British Airways-USAir alliance. The alliances of Iberia with Aerolineas Argentinas and Viasa are also not functioning as well as BA-US and KL-NW, an observation most possibly explained by the current financial difficulties of Iberia. The airline has consequently deemed it necessary to relegate its alliance strategy to lower levels in its list of priorities. Of the alliances forming the EQA, the SAS-Austrian Airlines alliance is the most effective

[65] Swissair and Delta Airlines only code-share on the Zurich-Atlanta and Zurich-Cincinnati inter-hub route, while SAS and Continental Airlines do not code-share with each other.

one yielding an increase of approximately 75% in inter-hub traffic. It is followed by the SAS-Swissair alliance (55%) and the Swissair-Austrian Airlines alliance (42%). Taken together, the transatlantic alliances produced an average increase of approximately 73% in inter-hub traffic while, in comparison, the EQA produced an average increase of approximately 57%. A preliminary conclusion that can be drawn is that trans-continental alliances are more effective than regional ones, most probably because the latter are much more likely to suffer from network overlap.

The first step in the modelling of airline alliance operational performance is now complete. A means of measuring alliance success has been defined and a methodology has been devised to isolate the effects of the alliance. The methodology has then been applied to the inter-hub routes where separation of alliance and non-alliance effects was necessary. The next step is to select and measure potential alliance success factors for model construction.

10.5 Modelling Scope and Density Economies in Airline Alliances

The method by which airline alliance performance is modelled here is to select a set of variables which are thought to contribute in bringing about alliance success and try to find any relationships that might exist between those variables and airline alliance performance. Again, regression analysis appears to be a mathematical tool which is well suited to that kind of approach. Null hypotheses concerning the effect of the variables are formulated and the statistical significance of the variable coefficients will provide evidence as to whether those hypotheses can be rejected or not.

At this preliminary stage, the basic model of alliance performance to be tested can be crudely formulated as follows

$$\Delta HPAX_A = f(network,\ service,\ competition) \qquad \textbf{(Eq. 10.12)}$$

where $\Delta HPAX_A$ refers is the alliance success measure, and *network*, *service*, and *competition* respectively refer to network-related, service-related, and competition-related factors influencing the success of the alliance. The selected variables are listed in Figure 10.6.

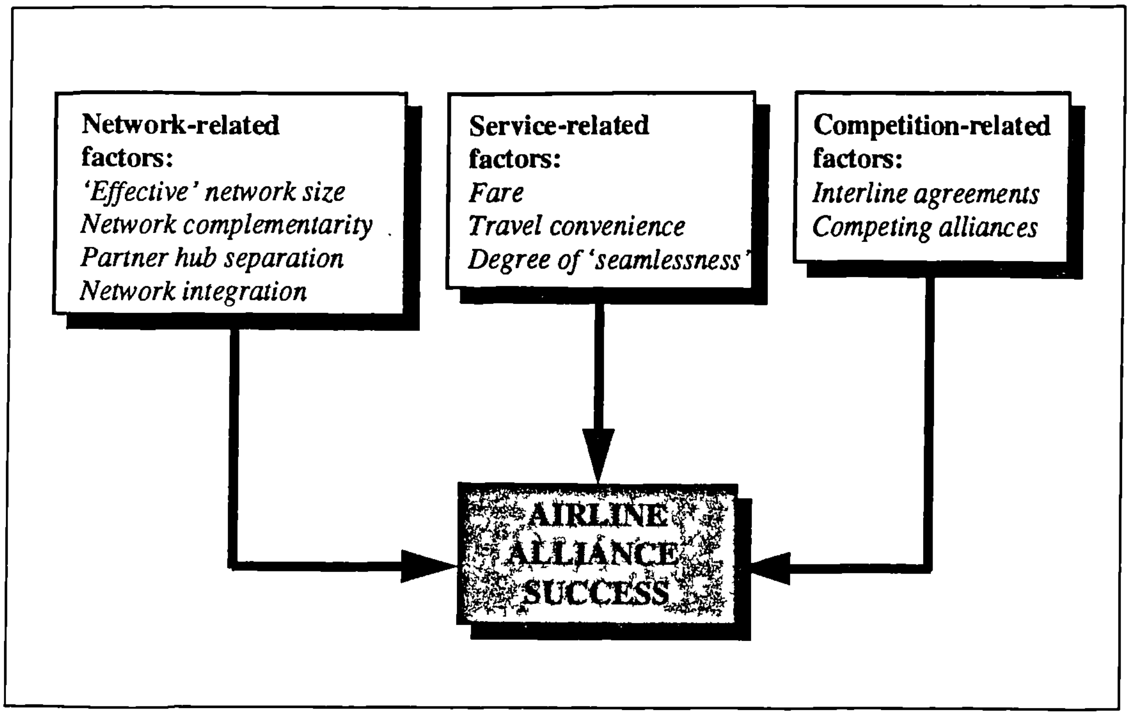


Figure 10.6 Factors affecting airline alliance performance

The following sections will explain the choice of the variables by describing how they are thought to affect alliance success. Means by which they will be measured will also be developed. Raw data used for the measurements of the variables and for model calibration is given in Appendix D.

10.5.1 Network-related factors

As was observed previously, one of the reasons for the formation of airline alliances is the need for airlines to extend their individual networks without however bearing the astronomical costs of doing so organically-that is to extend their 'effective' network (Youssef, 1992). Indeed, proper connection of networks can enable an airline to extend its reach to certain destinations in its partner's network, and market them as though they were its own, hence attracting more passengers. Furthermore, having a large network has advantages in that it gives the consumer the perception that the airline it is considering travelling with is financially strong, and that there is less risk of baggage loss or missed flights (Youssef and Hansen, 1994). Additionally, were the airline to code-share with its partner, it would satisfy consumers' preference for on-line connections (Bailey *et al*, 1985). Combination of networks and of FFPs allow passengers to collect and use points on a wider choice of destinations.

Evidence about the existence of benefits in the integration of networks was provided in the study on code-sharing performed by the US GAO (1995). According to this study, British Airways has benefited from a substantial increase in interline traffic with USAir from US cities other than those on which it code-shares. Indeed, the number of USAir to British Airways interline traffic rose by 60% from 1994 to 1995, while USAir is quoted to have earned approximately $12 million from increased interline traffic and the wet-lease agreement it has with British Airways.

From this discussion, one can conclude that certain characteristics of the airlines' individual networks, and of the ways in which they are linked together must affect the benefits that can be reaped from the alliance. They are proposed to be
(1) the change in effective network coverage of the airline combination,
(2) the degree to which the individual networks geographically complement each other,
(3) the degree to which the respective networks of the partner airlines are connected together, and
(4) partner hub separation.
Each of them are considered next.

10.5.1.1 Network coverage

Consequent to alliance formation, it is anticipated that the airlines will co-ordinate their schedules to bring departing H_y–D_i spoke flights closer to incoming H_x–H_y inter-hub flights and incoming O_i–H_x spoke flights closer to departing H_x–H_y inter-hub flights (see Figure 10.1). The availability of additional destinations (D_i) will increase the coverage of the airline combination making it more attractive, while the availability of additional origins (O_i) will increase the feed on the networks. The rationale for schedule co-ordination is also the intention of promoting the alliance flight option to better positions on CRS screens and of keeping transferring passengers onto the combined airline system, rather than them choosing to interline with a competing carrier. Since passengers prefer travelling with airlines with large networks, the following null hypothesis about network size change can be postulated:

h_1: Alliance success is positively related to alliance 'effective' network size

Network size measurement

The network coverage improvement ($\Delta NSIZE$) resulting from alliance formation can then be defined as the sum of

(1) The number of additional destinations offered to the customer as a result of the improved link ($\Delta DESN$), and

(2) The number of additional origins feeding into the inter-hub flight ($\Delta ORIG$).

However, networks overlap and connections between hubs is not optimal so that not all origins and destinations contribute to increasing network coverage. A set of constraints is therefore required to enable the determination of the effective number of origins and destinations (termed as connectable) which can be included in the alliance network

Constraint I: Minimum Connect Time

The minimum connect time (M_nCT) is an airport characteristic and is the minimum time required for a passenger to be processed through the airport. It varies according to the nature of the flight (domestic-domestic, domestic-international, international-domestic or international-international). Obviously, passengers will be unable to connect to any flights leaving in that time period.

Constraint II: Maximum Connect Time

If a passenger is prepared to wait indefinitely at the connecting hub, then it is theoretically possible for him/her to connect to all services from/to that hub (Dennis, 1994). However, in practice, there is a limit to the time a passenger is prepared to wait for a connecting flight; this limit is termed the maximum connect time (M_xCT). If the connecting flight to the required destination lies within the time limit, then that destination can be qualified as connectable. It is recognised that the waiting time tolerance depends on the type of passenger. The businessman values his time very highly and the flight option incorporating a long layover is unattractive to him. On the other hand, the tourist is more liable to trade off a long layover for a low fare.

Since waiting time effectively varies with each and every individual, it has been arbitrarily selected in many studies. For example, in his analysis of airline alliances, Youssef (1992) sets an upper limit of seven hours to the waiting time while recognising that it is a very high value. He justifies the upper limit by the necessity to collect a large sample of connecting services for his analyses. Bailey *et al* (1985) approach the problem more rationally and argue that passenger waiting time depends on the type of airport where the flight originates or ends. They therefore set the M_xCT to two hours for flights where both the origin and destination are large to medium hubs, and to three hours where either the origin or destination is a small hub or a non-hub.

For the purposes of this study, it is argued that connecting passengers select the flight option which minimises the total journey time and will therefore consider the waiting time in relation to the actual flying time. For example, if the journey is short-haul, the passenger will be unwilling to wait for a long time for his/her connection. Indeed, for short haul air travel, a long waiting time can have a substantial impact on the total journey time and can go to the extent of doubling it. As the length of haul increases, the waiting time becomes less critical since its contribution to the total journey time decreases. The above argument can be expressed mathematically as follows[66]:

$$Ttime = Ftime + Wtime \qquad \textbf{(Eq. 10.13a)}$$

where *Ttime* is the total journey time, *Ftime* is the time in flight and *Wtime* is the waiting time at the connecting hub. Dividing throughout by *Ttime* followed by mathematical manipulation gives

$$\left(\frac{Wtime}{Ttime}\right) = 1 - \left(\frac{Ftime}{Ttime}\right) = 1 - \left(\frac{\left(\mathrm{H}_x - \mathrm{H}_y\right)_t}{Ttime} + \frac{\left(\mathrm{H}_y - \mathrm{D}\right)_t}{Ttime}\right) \qquad \textbf{(Eq. 10.13b)}$$

[66] The discussion is based on destinations. However, the same arguments apply for origins.

where $(H_x–H_y)_t$ and $(H_y–D)_t$ refer to flying times of the inter-hub and hub-to-destination portions of the trip. From Equation 10.13b, one can deduce that short H_x–H_y and H_y–D flights lead to a waiting time which constitutes a high proportion of total journey time. The contrary is true when H_x–H_y and H_y–D flights are long-haul. On this basis, waiting times are assumed to be as in Figure 10.7.

Length of haul	***Short***	***Medium***	***Long***	**H_x–H_y ⇒**
Short	*2*	*3*	*4*	
Medium	*3*	*4*	*4*	
Long	*4*	*4*	*5*	
H_y–*D*⇓				

Short-haul: *Ftime* ≤ 3 hrs
Medium-haul: 3 hrs < *Ftime* ≤ 5 hrs
Long-haul: *Ftime*> 5 hrs

Figure 10.7 Passenger waiting times (hrs) at connecting hubs

The Time Window defined by constraints I and II is shown in Figure 10.8.

Constraint III: Common destinations

Destinations common to both networks are eliminated as it very unlikely for a passenger to go through H_y on his/her way to D when a direct flight from H_x exists. The same applies for origins.

Constraint IV: Backtrack

Passengers inherently have in mind the circuit that they are going to fly. Where the H_x–H_y–D flight is fairly uni-directional (Figure 10.9a), consumers are likely to fly with the alliance. However, if it involves considerable backtracking (Figure 10.9b), they will certainly consider the alliance option unattractive and will fly with a competing airline/alliance. Therefore, those origins/destinations which involve considerable backtracking do not contribute towards increasing network coverage.

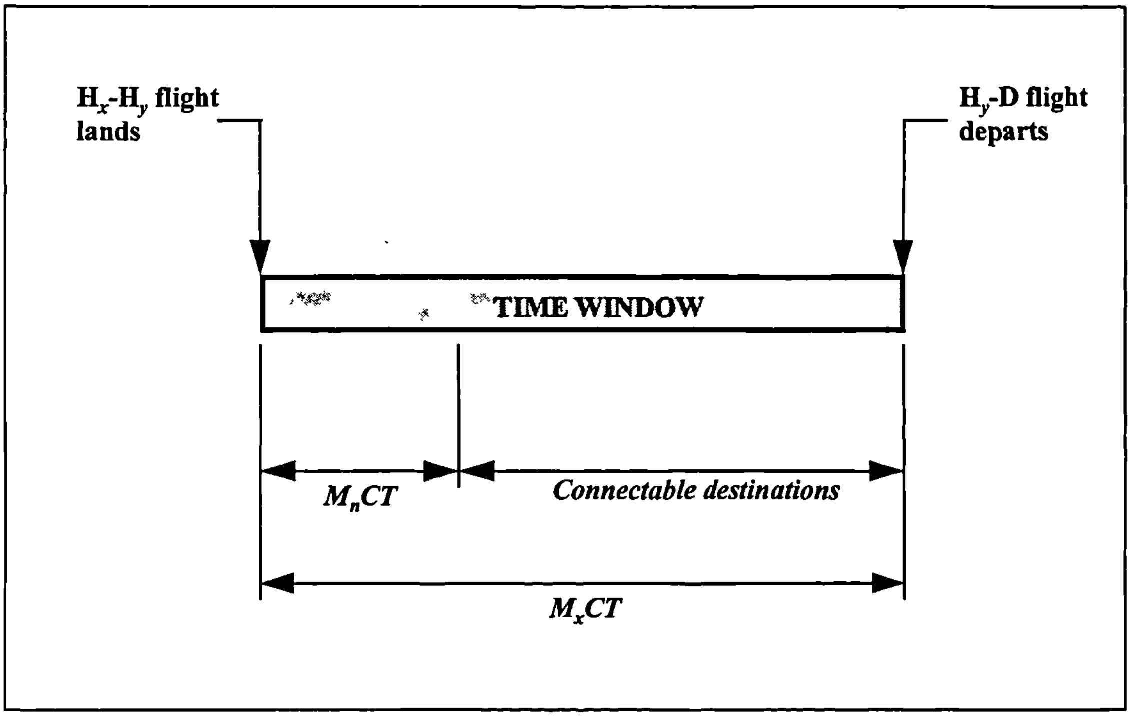


Figure 10.8 Definition of the connectable destination

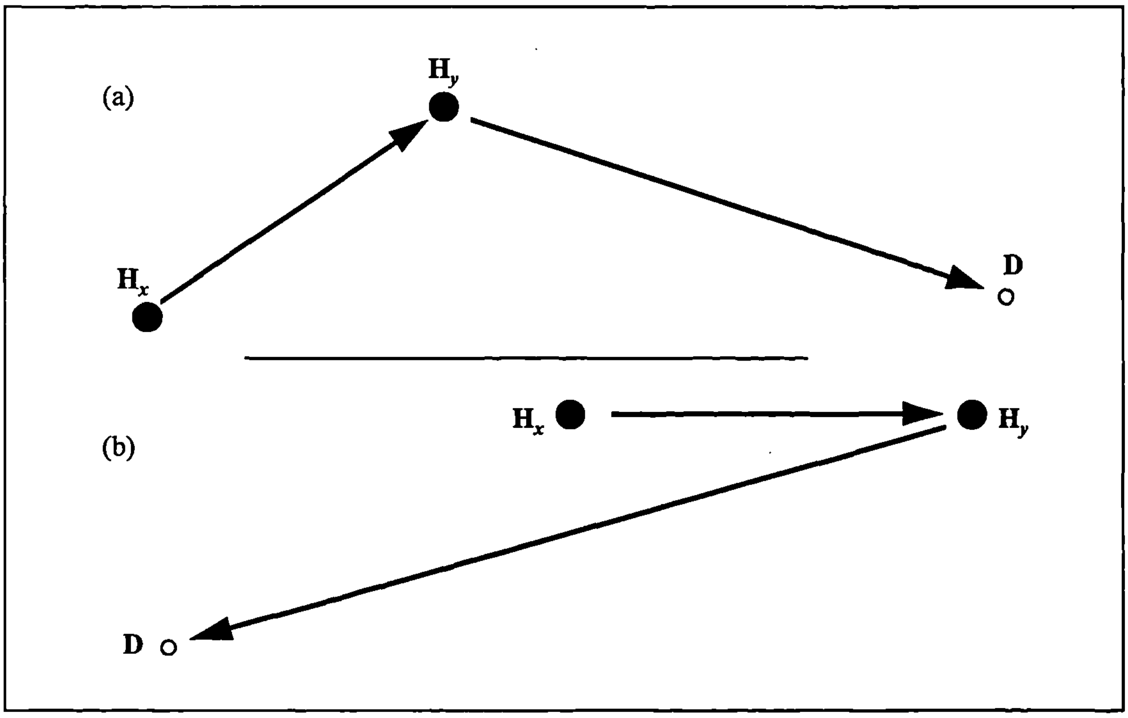


Figure 10.9 Illustration of constraint 4

In order to screen out the unwanted origins/destinations, a means of quantifying the acceptable amount of backtrack is necessary. Based on Ricout (1994), the measure (B) for origins and destinations is defined as

$$B_{ORIG} = \frac{O - H_y}{(O - H_x) + (H_x - H_y)} \qquad \textbf{(Eq. 10.14a)}$$

$$B_{DESN} = \frac{H_x - D}{(H_x - H_y) + (H_y - D)} \qquad \textbf{(Eq. 10.14b)}$$

respectively, where variables on the right hand side of the Equations 10.14a and 10.14b refer to great circle distances. Low values of B imply a high degree of backtrack. For the purposes of this study, destinations with values of B lying in the range 0 to 0.75 will be screened out.

Application of the four constraints before and after alliance formation will give the additional network coverage achieved as a result of co-operation. However, the number of connectable origins and destinations in and by itself does not appropriately capture the network coverage variable. This is because of the differing frequencies with which they are served. Therefore, when modelling alliance success, the frequency-weighted number of connectable origins and destinations will be used to quantify the change in effective network size:

$$\Delta NSIZE = \sum \Delta F_{ORIG} + \sum \Delta F_{DESN} \qquad \textbf{(Eq. 10.15)}$$

where F refers to the frequency-weighting.

Code-sharing

The discussion in Chapter 6 has shown that code-sharing is more powerful than interlining in the quest for marketing advantages. Indeed, while interlining is a passive agreement between two airlines, code-sharing is a more aggressive marketing tool geared towards gaining a competitive edge against competitors. Evidence of the benefits of code-sharing have been provided by GRA (1994) and the US GAO (1995).

Considering the importance of code-sharing, it is necessary to incorporate it into the model. This is achieved by attaching a weighting of 2 to code-shared destinations[67] to indicate that they contribute to network expansion to a greater extent than simple interlining.

10.5.1.2 Network complementarity

Complementarity is a term used to describe the level of duplication between the partners' individual networks. Network complementarity is considered as an important factor contributing to the success of airline alliances, and has influenced the choice of partners in a number of cases. Indeed, Debbage (1994, p.195) observes that '...of the four or five global alliance networks that will likely dominate intercontinental city-pair markets, it is widely anticipated that the BA/USAir operation will be competitive *because of the geographic complementarity of the route network*' (emphasis added). Network complementarity is particularly important when the objective of the alliance is to access new markets for the reason that minimal network overlap allows each airline in the partnership to have access to a greater number of markets than if the overlap were substantial. Moreover, it can be critical when the formation of the alliance affects competition and requires the acceptance of competition authorities. According to US DoT and US Justice Department officials, the level of integration achieved by KLM and Northwest Airlines would have been acceptable even if the alliance had not benefited from antitrust immunity since the two airlines were not significant competitors on most routes. On the other hand, Lufthansa and United Airlines compete on many city-pair markets and competition would suffer negative effects if the alliance were granted antitrust immunity (GAO, 1995). As high network complementarity is expected to be beneficial to alliance success, the following null hypothesis can be formulated:

h_2: Alliance success is positively related to the network complementarity of the airlines in the partnership

[67] That is, the frequency at which code-shared destinations are served is doubled when applying the measure of network coverage change defined by Equation 10.15.

Measurement of network complementarity

Since network complementarity is determined by the amount of overlap between the networks (Shaw and Ivy, 1994), the number of destinations common to both networks can be used as a basis for defining a measure for it:

$$NCOMP_{xy} = 1 - \frac{\sum D_{c,xy}}{\sum D_x + \sum D_y} \qquad \textbf{(Eq. 10.16a)}$$

where $NCOMP_{xy}$ is the complementarity between the networks of airlines x and y, $\Sigma D_{c,xy}$ is the number of destinations served by both airlines x and y, and ΣD_x and ΣD_y are the network sizes of airlines x and y in terms of destinations served. Division by the combined network size is necessary to correct for the differing scale of operations of airlines at their hubs. According to Equation 10.16a, a high proportion of common destinations in the combined network reflects a low complementarity and vice-versa.

In the same way as the effective network size variable, it is recognised that the number of common destinations in and by itself does not totally capture the synergistic potential of networks. This is again because of the different destinations are served with different frequencies. An improved measure of network complementarity is therefore obtained by weighting the destinations by their respective frequencies:

$$NCOMP_{xy} = 1 - \frac{\sum F_{c,xy}}{\sum F_x + \sum F_y} \qquad \textbf{(Eq. 10.16b)}$$

where F refers to the frequency weighting.

10.5.1.3 Hub separation

Hub separation refers to the distance between the hubs of the partner airlines, and defines the global reach of the alliance. An alliance is expected to be successful when partners are based far from each other because then, the alliance is more likely to be the only quasi on-line option involving only one stop. In addition, the further the networks are from each other, the lesser will be the degree of overlap between them. The null hypothesis is therefore

h_3: Alliance success is positively related to the distance between the hubs of the alliance partners

10.5.1.4 Network integration

The term integration is used to describe the degree to which the separate networks of the airlines in the alliance are linked together to offer the consumer a greater choice of destinations. A better linkage between the networks allows easy transfer from one to the other and therefore enhances the perception that the two networks are not separate, but are in fact a single entity. The quantity which is considered to reflect the quality of the connection of networks is the inter-hub frequency. In general, the formation of alliances is accompanied by substantial increases in inter-hub frequency (see Figure 10.3). This theoretically improves network integration by facilitating access to each. Consumer choices of flight times are less constrained and the probability of potential travellers securing seats on their desired flights is raised (Bailey *et al*, 1985; Ippolito, 1981). An increase in frequency is also expected to stimulate demand on the inter-hub route and, to a lesser extent, on spokes as well. Another advantage of inter-hub frequency increases is that it improves the attractiveness of the alliance option relative to competitors in O-D markets so that it stands a better chance of being chosen by travellers. Finally, an increase in frequency will raise the market share of the alliance on the inter-hub route, as theorised by Taneja's *S*-curve (Taneja, 1976, 1981). For those reasons, the null hypothesis is formulated as follows:

h_4: Alliance success is positively related to network integration

Owing to certain data limitations detailed in section 10.4.2.3 alliance inter-hub frequency is proxied by capacity.

10.5.2 Service-related factors

A main objective of airline alliances is to provide the consumer with a complete product which has certain features absent in competitors' products, hence making the option of flying with the alliance more attractive. Some of those features which have been analysed above are related to the networks. This section will analyse another set of alliance characteristics which are related to the service it offers. Included in this set are the fare, the travel convenience and the degree of 'seamlessness'.

10.5.2.1 Fare

How alliance formation affects fares was briefly analysed in section 10.4.1. Evidence provided by Youssef (1992) indicates that fares in inter-hub markets are very likely to rise as the airlines cease competing for traffic and achieve enough market power to oust Fifth Freedom carriers out of the markets. Yet, when it comes to O-D markets, the alliance could lead to decreases in fares as a result of cost savings achieved by the combination of operations and density economies on inter-hub routes. Cost savings on the supply side achieved as a result of co-operation could also lead to lower fares.

In addition, though competition in inter-hub markets is likely to decrease after alliance formation, competition in O-D markets could increase with the formation of comparable competing alliances (GRA, 1994). This situation is apparent on Europe-US O-D markets where travellers have the option of flying with either British Airways-USAir, KLM-Northwest and Lufthansa-United, not considering the other interlining possibilities available. The alliances would then have to reduce fares in order to remain competitive. Since the effect of fares on passenger traffic is not clear, the null hypothesis is formulated as follows:

h_5: Alliance success is related to alliance fares

Fare measurement

It is necessary to include an aggregate measure of fares in the alliance model. Studies on fares in the airline industry have made use of airline yield (revenue per passenger-kilometre) as an overall measure of fare levels (for example, Morrison and Winston, 1989). In this thesis, this measure is slightly modified to take into account the integration between the two airlines in the partnership and the competitive pressures they might experience. The measure (*YIELD_A*) is defined as

$$YIELD\_A = \left(\frac{Revenue_x + Revenue_y}{RPK_x + RPK_y} \right) \qquad \textbf{(Eq. 10.17)}$$

where subscripts x and y are the airlines in the alliance, and *RPK* represents the revenue passenger-kilometres carried by the airlines.

10.5.2.2 Travel convenience

Travel convenience is a term describing the ease with which a passenger can reach his/her destination. A major factor affecting travel convenience is the timing of flights[68] (Bailey *et al*, 1985). As in any scheduled system, airlines can offer capacity in discrete units while demand for airline services is continuous. As a result, most air travellers must depart/arrive at a time other than the most preferred time. This travel constraint effectively makes scheduling a competitive tool: the effectiveness with which the discrete units of supply are matched with the continuous demand defines the travel convenience.

The same logic is relevant to the alliance context. For a passenger travelling from H_x to D via H_y, the amount of time for which he/she has to wait for the connecting flight at H_x will affect his/her level of perceived travel convenience as provided by the alliance system. If the layover time is long, then the connection will bear no difference with the standard interline agreements in existence. It is therefore in the interest of alliance partners to co-ordinate their schedules to bring their respective incoming and outgoing flights closer together and, in doing so, decrease passenger waiting time at the connecting airport. Only then will the passenger view the combined airline system as one single entity. Since travel convenience is considered to be an important variable in the model of alliance success, the null hypothesis is

h_6: Alliance success is positively related to travel convenience

---

[68] Other factors are service frequency and the directness of flights (number of stops and backtrack) which have already been considered.

Travel convenience measurement

In a study on the value of time in air travel, Douglas and Miller (1974) quantify travel convenience by 'schedule delay' which they define as the absolute difference between passengers' most preferred departure/arrival time and that of their actual departure/arrival time[69]. This measure can be adapted to the alliance context where the preferred departure time of the transiting passenger can be assumed to lie immediately after the M_nCT (see Figure 10.8). However, it is highly unlikely for all the departing flights of the partner airline lying within the Time Window specified in Figure 10.8 to be grouped at that time. Rather, they will follow a certain distribution, a hypothetical one being shown in Figure 10.10.

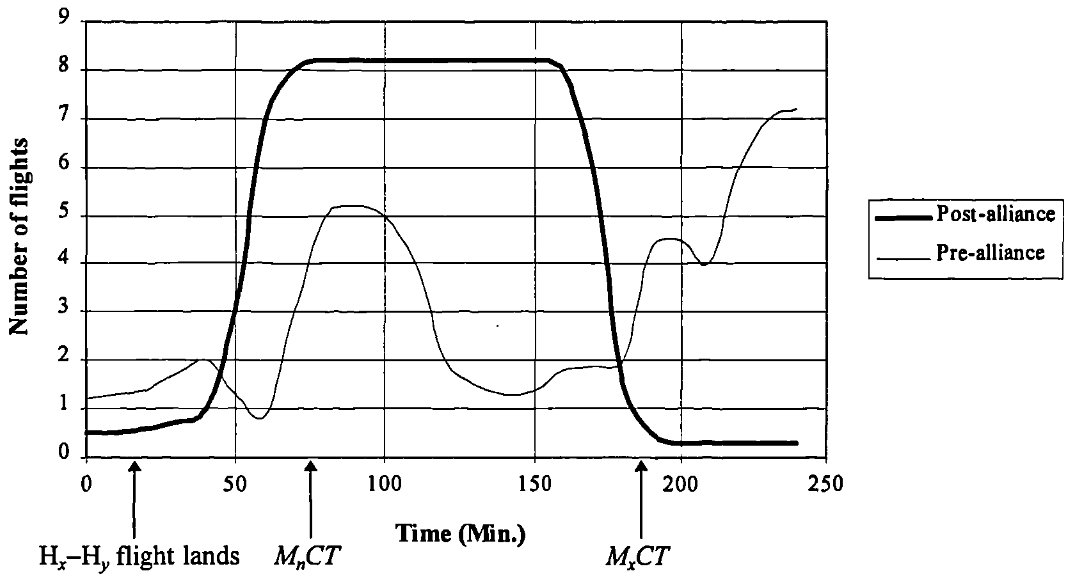


Figure 10.10 Hypothetical distribution of alliance connecting flights before and after alliance formation

If the departing flights are grouped far from the M_nCT, then the average passenger waiting time will be long and the flight routing via the alliance connecting hub will not be favourably rated by customers. After alliance formation, the partners will try to schedule their flights in such a way that the incoming O–H_x flights are close to the

[69] To this, they add an expected delay resulting from the inability of the customer to secure a seat on the preferred flight owing to high load factors.

departing H_x–H_y flight, and that departing H_y–D flights are close to the incoming H_x–H_y flight. The average waiting time at H_x and H_y will thus be lowered, and the flight routing will be more favourably rated.

A measure of travel convenience is then the average time a passenger has to wait for his/her connecting flight, defined as the ratio of the sum of schedule delays to the total number of origins/destinations. The travel convenience (*TCONV*) of the alliance network is taken as the sum of the averages of the waiting times at H_x and H_y:

$$TCONV = \frac{\sum SD_{H_x}}{n_o} + \frac{\sum SD_{H_y}}{n_d} \qquad \textbf{(Eq. 10.18)}$$

where SD_{H_x} and SD_{H_y} are the schedule delays at H_x and H_y respectively, and n_o and n_d are the number of connectable origins and destinations respectively.

A situation can arise where the same origin comes up at different arrival times in the Time Window. In those cases, the last arrival time is selected since passengers will select flights in such a way as to minimise their waiting time. For the same reason, the first departure time is selected if the same destination is present at different departure times in the Time Window. Where no direct alliance inter-hub flight exists (for example, Zurich-Cincinnati and London-Baltimore in 1989), the waiting time at the stop is added to the average waiting time at the connecting hub for that flight option to incur a high time penalty.

10.5.2.3 Degree of 'seamlessness'

The belief currently prevailing in the airline industry is that passengers want to experience seamless travel when transferring from one airline to the other. For that reason, many alliance partners are attempting to harmonise their service levels. It is anticipated that harmonisation of service of the alliance partners will improve their traffic levels so that the null hypothesis is

h_7: Alliance success is positively related to the degree of seamlessness

Measurement of the degree of seamlessness

The quantification of the degree of similarity between alliance carriers necessitates the identification of those major characteristics which affect travellers' perception of seamless travel. The proxy for the degree of seamlessness (*SEAM*) will incorporate the following variables:

(1) The reciprocal of the difference in the average age (*AGE_A*) of the aircraft in the airlines' fleets. Passengers generally prefer travelling on board new aircraft for safety and aesthetic reasons. An apparent difference in aircraft age could be viewed by passengers unfavourably. However, in many cases, passengers do not actually see the aircraft they are boarding and they usually perceive aircraft age as a function of the amount of noise it generates. Therefore, a lower weighting is attached to this variable. The reciprocal of the difference is taken for a large average age discrepancy indicates low seamlessness and vice versa. Age data is obtained from Dempsey and Goetz (1992) and from airline financial reports.

(2) The provision of through check-in (*T_CHECK*). A dummy is used to represent this variable ('Yes' = 1; 'No' = 0).

(3) The use of the same terminal at connecting hubs (*TERMINAL*). A dummy is used to represent this variable ('Yes' = 1; 'No' = 0).

(4) The practice of joint advertising (*J_ADVERT*) to create awareness of the airline combination. A dummy is used to represent this variable ('Yes' = 1; 'No' = 0).

(5) The reciprocal of the difference in seat pitch (*S_PITCH*) which is represented by the average aircraft capacity in the fleet. The reciprocal is taken for the same reason as for *AGE_A*.

(6) The difference in in-flight service (*SERVICE*). This is a very difficult variable to quantify as in-flight service is made up of a number of non-measurable items (such as food and drink) and is very subjective. In-flight service will be measured by the average number of flight attendants per seat. This measure does have shortcomings but it is considered to be the best one which affords some quantification of the treatment passengers are expected to receive on board aircraft.

The provision of a combined FFP also contributes to projecting the alliance as a single entity. However, all the airline partners in the sample had combined their FFPs so that it is not necessary to include that variable. Items (4) and (5) will be given a higher weighting than the others as they are considered to be more important in enhancing the perception of seamless travel. Combination of variables is carried out by standardisation[70] throughout the sample followed by addition. Thus negative values for $SEAM$ indicate that the alliances have a degree of seamlessness which is below the average in the sample of selected alliances (considered as less effective alliances) while positive values of $SEAM$ are for alliances providing a degree of seamlessness above the sample average (more effective alliances).

10.5.3 Competition-related factors

The formation of an alliance is very likely to result in some kind of reaction from competitors for it constitutes a considerable threat to their market share. The degree of competition is therefore a major factor shaping the success of airline alliances. Competition is experienced mainly in O–D markets ($O \rightarrow H_x \rightarrow H_y \rightarrow D$) and comes from airline interlining agreements and from other alliances. The situation is depicted graphically in Figure 10.11.

Passengers from those cities represented by squares have the choice of travelling with two alliances to reach their destination. There is unsubstantiated evidence that competition between alliances is hotting up, particularly between Europe and the US with the formation of three strong alliances (British Airways-USAir, KLM-Northwest Airlines, and Lufthansa-United Airlines). Increased levels of competition are expected to affect alliance success negatively so that the null hypothesis is

h_8: Alliance success is negatively affected by competition levels

[70] The standard value of variable X is obtained from the following expression:

$$\frac{X - \bar{X}}{\mu}$$

where $\bar{X}$ is the mean of variable X, and μ is its standard deviation. Standardisation creates dimensionless variables which can then be added algebraically together.

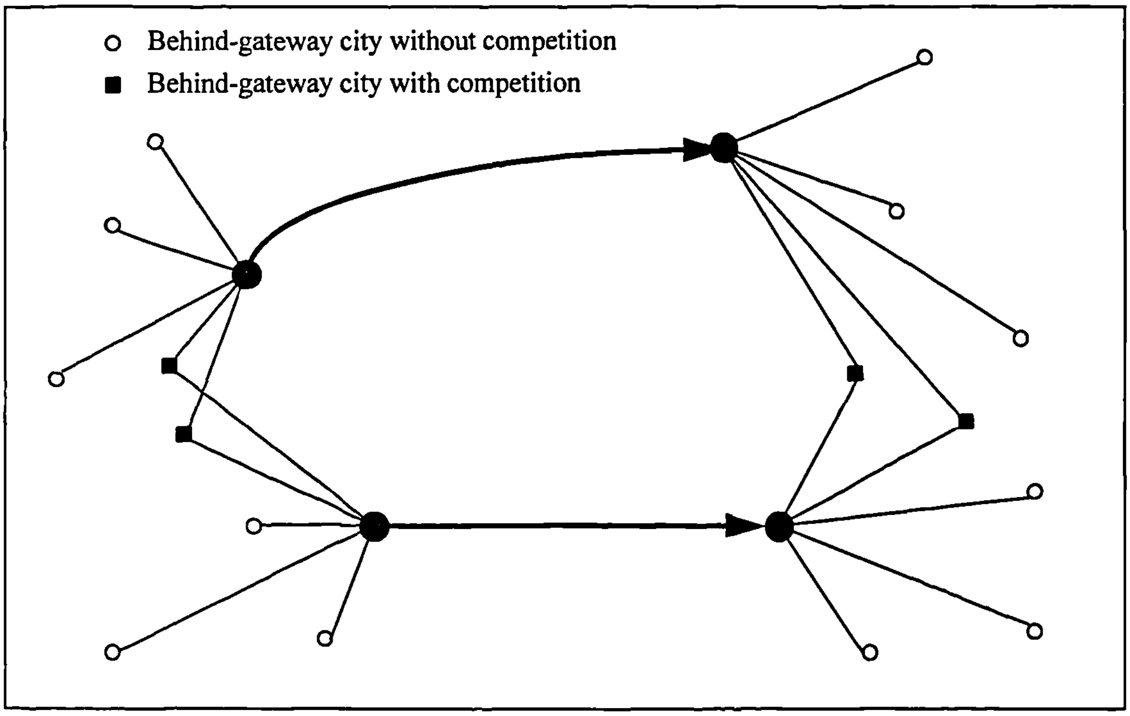


Figure 10.11 Competition between alliances
Adapted from GRA (1994)

Measurement of the level of competition

The measure of the level of competition (*lcom*) experienced by an alliance in an O–D market can be taken as the number of effective competitors (frequency-weighted) in that particular market, where effective has been defined in section 10.4.2.3. For all O–D markets served by the alliance for a particular hub combination, the overall level of competition (*LCOM*) is taken as the average frequency-weighted number of competitors:

$$LCOM = \frac{\sum_{i=1}^{N}\sum_{c}^{n} F_c}{N} \qquad \textbf{(Eq. 10.19)}$$

where F_c is the frequency of competitor c, n is the number of competitors to the alliance in O–D market i and N is the number of O–D markets served by the alliance. Since on-line connections and other alliances provide more effective competition than interline connections, they are given a higher weighting when calculating *LCOM*. A simple example is provided below to illustrate how the computation of *LCOM* is performed. Effective competitors and their frequency of service are obtained from the *ABC World Airways Guide*.

Example

For airline alliance A operating between hubs H_x and H_y, the competition in O–D markets is as in Table 10.4.

O–D markets	Competitors	Freq/wk
$(O\text{–}D)_1$	c_1	2
	c_2	1
	c_3	3
	$lcom(O\text{-}D)_1$	*5*
$(O\text{–}D)_2$	c_1	3
	c_2	4
	$lcom(O\text{-}D)_2$	*7*
$(O\text{–}D)_3$	c_1	4
	$lcom(O\text{-}D)_3$	*4*

Table 10.4 Illustration of the computation of the level of competition

The level of competition for the H_x–H_y combination is given by

$$LCOM_{H_x-H_y} = \frac{\sum lcom}{number\ of\ O\text{-}D\ markets} = \frac{16}{4} = 4 \qquad \textbf{(Eq. 10.20)}$$

One problem is that the number of O–D markets served by an alliance is large, and considering the number of inter-hub combinations included in the analysis, computation of *LCOM* can be very time-consuming. Therefore, in order to facilitate the task, origins are taken to be at H_x instead of O (see Figure 10.11) so that the level of competition in $H_x \rightarrow H_y \rightarrow D$ markets is taken to approximate the level of competition in $O \rightarrow H_x \rightarrow H_y \rightarrow D$ markets.

10.6 Model Formulation And Results

10.6.1 Model formulation

The model of airline alliance performance can now be formulated in a more formal way as follows:

$$\Delta HPAX_A = f(\Delta NSIZE, NCOMP, S\_HUB, \Delta HCAP, \Delta YIELD\_A, \Delta TCONV, SEAM, \Delta LCOM)$$

(Eq. 10.21)

where

$HPAX_A$ is the inter-hub passenger traffic of the alliance;

NSIZE is the effective network size of the alliance;

S_HUB is the distance between the partners' hubs;

HCAP is the inter-hub capacity of the alliance;

YIELD_A is the average yield of the alliance on the inter-hub route;

TCONV is the average waiting time at the alliance hubs;

SEAM is the degree of seamlessness between the partners;

LCOM is the average level of competition experienced by the alliance in its markets; and

Δ is the change in value from the pre-alliance period to the post-alliance period.

Two specifications of the model are run:

Linear model:

$$\Delta HPAX_A = a_0 + a_1(\Delta NSIZE) + a_2(NCOMP) + a_3(S\_HUB) + a_4(\Delta HCAP) + a_5(\Delta YIELD\_A) + a_6(\Delta TCONV) + a_7(SEAM) + a_8(\Delta LCOM)$$

(Eq. 10.21a)

Semi-logarithmic model

$$Ln(\Delta HPAX_A) = b_0 + b_1 Ln(\Delta NSIZE) + b_2 Ln(NCOMP) + b_3 Ln(S\_HUB) + b_4 Ln(\Delta HCAP) + b_5(\Delta YIELD\_A) + b_6(\Delta TCONV) + a_7(SEAM) + a_8(\Delta LCOM)$$

(Eq. 10.21b)

One of the disadvantages of using the logarithmic transformation here is that the model variables are in fact *changes* which can be negative or zero, in which cases it is impossible to take logarithms. Therefore, the logarithmic transformation was applied only to those variables which had the positive sign throughout most of the data, hence the semi-log model. Variable summary statistics are given in Table 10.5 below.

Variable	μ	σ^2
ΔHPAX	28874.57	25844.32
ΔNSIZE	201.14	219.59
NCOMP	0.7633	0.2035
S_HUB	4733.38	2994.32
ΔHCAP	44107.95	39226.09
ΔYIELD_A	-4.06	4.30
ΔTCONV	23.85	34.62
SEAM	1.09	4.18
ΔLCOM	5.24	3.49
Ln(ΔHPAX)	10.15	0.89
Ln(ΔNSIZE)	4.83	1.31
Ln(NCOMP)	-0.25	0.22
Ln(S_HUB)	8.30	0.84
Ln(ΔHCAP)	10.56	0.74

Table 10.5 Summary statistics of variables in the model of alliance performance
(μ: *mean*; σ^2: *standard deviation*)

The models are checked for normality using normal *Q-Q* plots[71] of the residuals and *K-S* statistics[72]. The normality assumption held quite well for the linear model. This was not the case for the semi-log model which showed departures from normality.

The correlation matrices of the two models were used to investigate the presence of multicollinearity. A high correlation ($r = 0.7713$; $p = 0.000$) was observed between the hub separation (*S_HUB*) and network complementarity (*NCOMP*) variables. The high variable inflation factors[73] (*VIF*) confirmed that the correlation was creating the problem of multicollinearity in the models. When the regressions were run, both variables to adopted the 'wrong' (negative) sign. The relationship between *S_HUB* and *NCOMP* can be explained by the fact that the further are the networks apart, the less likely they are to overlap. Furthermore, if the networks are close, it is most

[71] The *Q-Q* plot pairs each observed value with its expected value in the normal distribution. If the sample is from a normal distribution, the points are expected to lie approximately on a straight line with slope 1.

[72] The *K-S* statistic tests for the hypothesis that the data is from a normal distribution. Low significance levels for the *K-S* statistic lead to the rejection of the hypothesis.

[73] *VIF* is defined as $\frac{1}{1-R_i^2}$ where R_i^2 is the multiple correlation coefficient of the *i*th independent variable is predicted from other independent variables. A high VIF_i indicates that variable *i* is almost a linear combination of the other independent variables (Norusis, 1993).

probable that they will be situated in the same world region. With the formation of regional blocks as the European Union and the North American Free Trade Agreement (NAFTA), and the spread of deregulation and liberalisation, there will be certainly exist liberal bilaterals between the countries in those regions. This will result in many common destinations served by the carriers operating in those regions. On the other hand, most airlines based at hubs in different world regions will not benefit from such liberal bilateral agreements between their countries and, as in the case of the UK and the US, common points in the networks of the allied carriers are limited to gateways. To correct the problem of multicollinearity, the *S_HUB* variable was discarded from the model. As a consequence, the sign of the *NCOMP* variable reverted to positive in the regressions.

The assumption of equality of variance in the regressions was checked using scatterplots of standardised regression residuals against standardised predicted values. For both models, the residuals lay in a random distribution about the horizontal line through zero, hence homoscedasticity. The results of the various statistical tests are given in Appendix D.

10.6.2 Regression results

The results of the linear and semi-log regressions are given in Table 10.6. Only the network size, network complementarity, network integration, travel convenience and level of competition variables are significant at the 5% level in both models. The models of airline alliance performance can therefore be written as follows:

Linear model:

$$\Delta HPAX = 9.759\,(\Delta NSIZE) + 3.804\,(\Delta NCOMP) + 0.513\,(\Delta HCAP) - 0.106\,(\Delta TCONV)$$
$$-46.945\,(\Delta LCOM)$$

(Eq. 10.22a)

Semi-log model:

$$Ln(\Delta HPAX) = 6.219 + 0.065\,Ln(\Delta NSIZE) + 0.394\,Ln(NCOMP) + 0.619\,Ln(\Delta HCAP)$$
$$-0.012\,(\Delta TCONV) - 7.981\,(\Delta LCOM)$$

(Eq. 10.22b)

Variable	Coefficient	Linear model	Semi-log model
Intercept	a_0/b_0	-10699.704	6.219
		(-0.887)	(2.497)
		[0.3812]	[0.0014]
ΔNSIZE	a_1	9.759	–
		(2.819)	
		[0.0002]	
Ln(ΔNSIZE)	b_1	–	0.065
			(4.655)
			[0.0005]
NCOMP	a_2	3.804	–
		(2.217)	
		[0.0334]	
Ln(NCOMP)	b_2	–	0.394
			(2.685)
			[0.0049]
ΔHCAP	a_4	0.513	–
		(9.116)	
		[0.0000]	
Ln(ΔHCAP)	b_4	–	0.619
			(4.133)
			[0.0003]
ΔYIELD_A	a_5/b_5	893.583	0.061
		(1.199)	(1.207)
		[0.2390]	[0.2382]
ΔTCONV	a_6/b_6	-0.106	-0.01
		(-3.271)	(-2.288)
		[0.0021]	[0.0358]
SEAM	a-/b-	1971.667	0.062
		(0.863)	(0.175)
		[0.5740]	[0.6571]
ΔLCOM	a_8/b_8	-46.945	-7.981
		(-6.945)	(-4.173)
		[0.0002]	[0.0008]
Model test statistics:			
n		44	32
$\overline{R^2}$		0.766	0.671
F		20.170	15.195
		[0.0000]	[0.0009]

Table 10.6 Regression results for scope and density benefits of alliances
(n: number of data points)
Note: *t-statistics in circular brackets and level of significance in square brackets*

10.6.3 Discussion

In terms of explanatory power ($\overline{R^2}$), both models behave well with an explanatory power of approximately 77% for the linear model and 67% for the logarithmic model. This can be considered very satisfactory considering that the analysis was of a cross-sectional nature involving airlines of differing characteristics. Indeed, Norusis (1993) points out that low $\overline{R^2}$ values should be expected when a cross-sectional analysis is undertaken. The F-statistics of both models are highly significant, confirming the validity of the models. The lower explanatory power of the semi-log model can be explained by the fact that not all variables were transformed. In addition, of the transformed variables, some of the data points had to be dropped because they were negative. This lead to a decrease in sample size. Deviation from normality can also explain the lower explanatory power of the semi-log model.

Overall, the regression results confirm most of the hypotheses made about the variables in the model. The coefficient of the network size variable ($\Delta NSIZE$) in both models has the expected positive sign. Incidentally, the frequency-weighted measure of network size was observed to perform better than the non-weighted one. The coefficient of $\Delta NSIZE$ is significant at the 1% level in both models confirming the hypothesis that network size is a key variable for alliance success. Therefore, an airline should search for a partner with a large network in order to attract additional traffic onto its own network. Furthermore, the larger the partner's network, the more feed traffic will the airline receive. However, an important consideration is that the additional origins and destinations should be 'connectable', that is lying within airport and passenger waiting time limits. The significance of the network size variable leads one to conclude that alliances provide airlines with a major source of economies of scope. For example, passengers travelling with one airline can be made aware of the product in a larger number of markets. The preference of passenger for larger networks as proved in the models also indicates that the joint FFP of the combination will be quite strong and that the only FFPs capable of competing effectively with it will have to be operated on a comparable network size. According to the linear model, an additional connectable destination/origin can lead to an increase of approximately 10 passengers on the inter-hub route. In terms of percentages, a 1% in effective network size causes approximately 0.07% increase in alliance inter-hub pasenger traffic.

The network complementarity variable (*NCOMP*) is significant at the 1% level in the logarithmic model and at the 5% level in the linear model. It has the expected positive coefficient, that is the lower the overlap between networks, the more likely is the alliance to succeed. This is to be expected since a high degree of network overlap implies that there are many destinations which can be reached non-stop ($O \rightarrow D$) or stopping only once ($O \rightarrow H_x \rightarrow D$), rather than by being routed through the two-stop option ($O \rightarrow H_x \rightarrow H_y \rightarrow D$) provided by the alliance. The significant presence of the network complementarity variable in the model confirms that it is preferable for airlines to seek for partners based in different world regions to avoid network duplication. Where substantial duplication occurs (as in the EQA), measures should be taken for the partners to drop certain routes operated by both of them. However, it is recognised that this is not an easy task and can be done only if the partners have achieved such a degree of co-operation as to act as a single airline. The relationship also needs to be a very trusting one, and it can be argued that no airline alliance has reached that required level of trust yet. A network complementarity of 1 (no overlap) is expected to produce an increase of approximately 4 passengers between the partners' hubs. Alliance performance is elastic with respect to network complementarity: an increase in complementarity of 1% is expected to increase inter-hub traffic by approximately 0.4% according to the semi-log model.

The network integration variable (*HCAP*) is significant at the 1% level in both models, confirming that efficient connection between networks is important to alliance success. Indeed, increasing inter-hub capacity[74] contributes to raising passenger levels on that route and, as a consequence, on the networks of the partners as well. However, it is important to recognise that the source of increased inter-hub traffic is not exclusively the improved connection between the networks. It can also come from stimulation of traffic travelling between the two hub cities as a result of increased frequency. The formation of the alliance and the frequency increase can have the effect of decreasing the number of competitors operating in the inter-hub

[74] Hence frequency, if no change in aircraft takes place.

market with the consequent increase in the market share of the alliance, hence more passengers. The alliance models therefore proves that network connection is important for economies of network density. However, it is unable to separate the effects of the constituents of this variable. According to the linear model, an increase of 10 in inter-hub capacity is expected to increase the inter-hub passenger traffic by 5. In terms of percentages, an increase of 1% in inter-hub capacity leads to an increase of approximately 0.6% in passenger traffic between the partners' hubs.

In both models, the *YIELD_A* variable has the 'wrong' sign in that an increase in alliance yield (hence fare) results in an increase in traffic levels. However, the coefficients of the variable are not significant at the 1% and even at the 5% levels in both models so that the hypothesis that they are not equal to zero can not be rejected. One can conclude that fares in the markets operated by the alliance do not affect alliance passenger traffic. This could result from the market power which the combined hubbing strategy confers to the partner airlines. However, the non-significance of the variable representing fare levels can very well be the result of deficiencies in the method of measurement. Indeed, alliance operation is very localised in that it takes place only on certain markets and between certain airports. For example, the KLM–Northwest alliance was initially structured around the Northwest hubs of Boston, Detroit and Minneapolis. Extension of co-operation to include the Memphis hub came at a later stage. Therefore, taking the average yield over the whole networks of the airlines is not an appropriate representation of the average yield on the markets affected by alliance formation as factors other than the alliance affect fares on other parts of the airlines' networks. An improved measure of fares should take this into consideration and limit measurement to those markets affected by alliance formation. However, this procedure is limited by the lack of fare data on spoke markets. The use of *Y* fares on inter-hub markets did not give conclusive results because of the prevalence of the complicated fare structures leading to various discounts and also because the O-D through fare bears no relationship with the inter-hub fare. The absence of a relationship between the change inter-hub *Y* fare and the change passenger traffic is obvious in Figure 10.12 where the line of best fit is nearly horizontal.

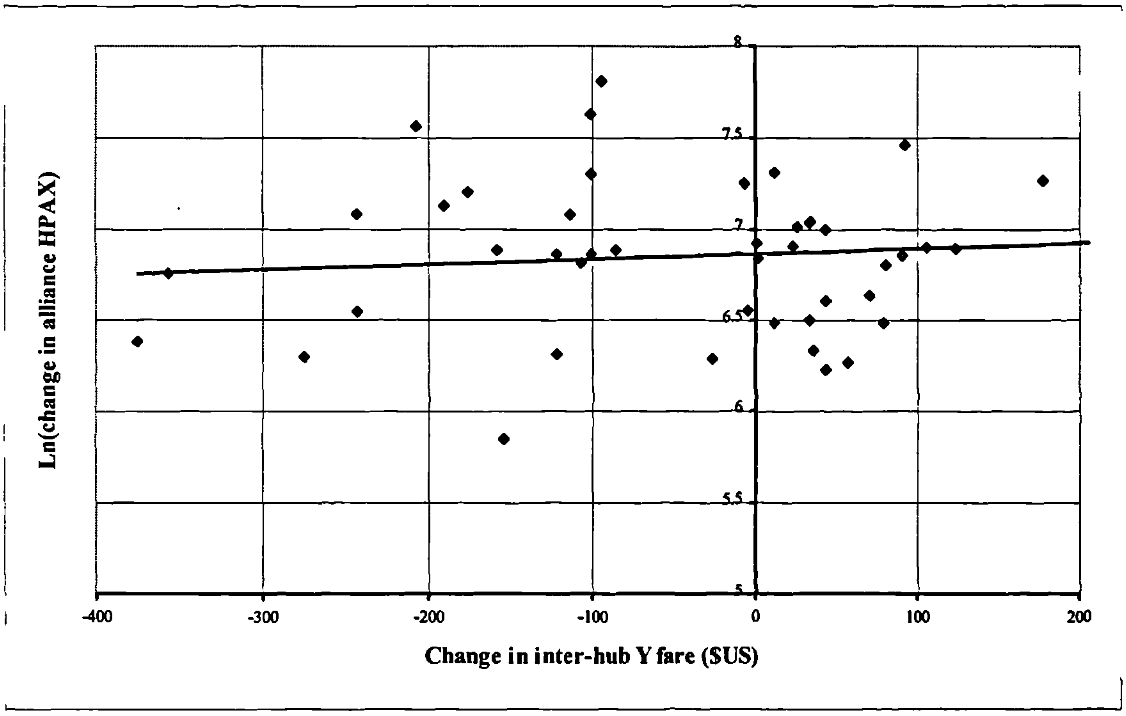


Figure 10.12 Scatterplot of $Ln(\Delta HPAX_A)$ v/s change in inter-hub *Y* fare

The travel convenience variable ($\Delta TCONV$) has the expected negative sign. It is significant at the 1% level in the linear model and at the 5% level in the semi-log model. Therefore, a decrease in connect time will increase traffic levels between the alliance networks. This confirms the belief that decreasing passenger waiting time at connecting airports improves the appeal of the overall product which the airlines offer to potential consumers. Decreases in connect time also promote the alliance flight option to better positions on CRSs. It is therefore in the interest of airline partners to match their flights appropriately for departing and incoming flights to lie as close as possible to each other. This is however not an easy task mainly because of slot availability problems due to airport congestion. Furthermore, partners might be reticent to move flights as their slot might be an attractive one gained painstakingly. Therefore, schedule co-ordination requires the partners to have reached a high level of trust and integration so as to act as a single airline. The model proves that schedule co-ordination brings significant benefits. According to the linear model, a decrease in average waiting time of 10 minutes at the hubs will increase passenger traffic by approximately 1. Inter-hub passenger traffic is not elastic with respect to average waiting time: a decrease of 1% in average waiting time increases passenger traffic by approximately 0.01%.

Travel convenience can be taken to form part of the attributes of seamless travel. However, since it lends itself more easily to quantification, it was deemed preferable to separate it from those other attributes of seamless travel which are less easily quantifiable. The coefficient of the seamless travel variable (*SEAM*), which incorporates those attributes, is not significant at the 5% level in the alliance models. This implies that the hypothesis that passengers are not affected by seamless travel can not be rejected. A possible explanation is that most passengers are more concerned about reaching their destination without the hassle of several stops, aircraft changes (as in the case of the traditional interlining practice) and long connect times than about service levels and similar in-flight standards, provided they satisfy some basic minimum criteria. It can also be argued that seamless travel affects mostly high-yield business class passengers who are more concerned with the ease and comfort of flying, and who are less tolerant to dramatic changes to service levels and in-flight standards. Figure 10.13 which shows the linear relationship between the change in alliance yield and the degree of seamlessness of the alliance, supports this argument. Leisure traffic is more likely to give fares priority over whether seamless travel is provided or not. Having said that, it is recognised that the degree of seamlessness of an alliance has been measured somewhat crudely in this research. Improved methods of measurement are necessary to investigate this issue further.

The change in the level of competition (*LCOM*) experienced by the alliance has the expected negative sign and its coefficient is significant at the 1% significance level. This indicates that a reaction is expected from competitors following alliance formation. The reaction will affect the eventual success of the alliance, and needs to be carefully appraised by the partners-to-be. Two types of competitor reaction are expected: either they will move out of markets where the alliance achieves substantial market power, or they will co-operate to confront the alliance more effectively. Alliance success is highly dependent on competitor reaction.

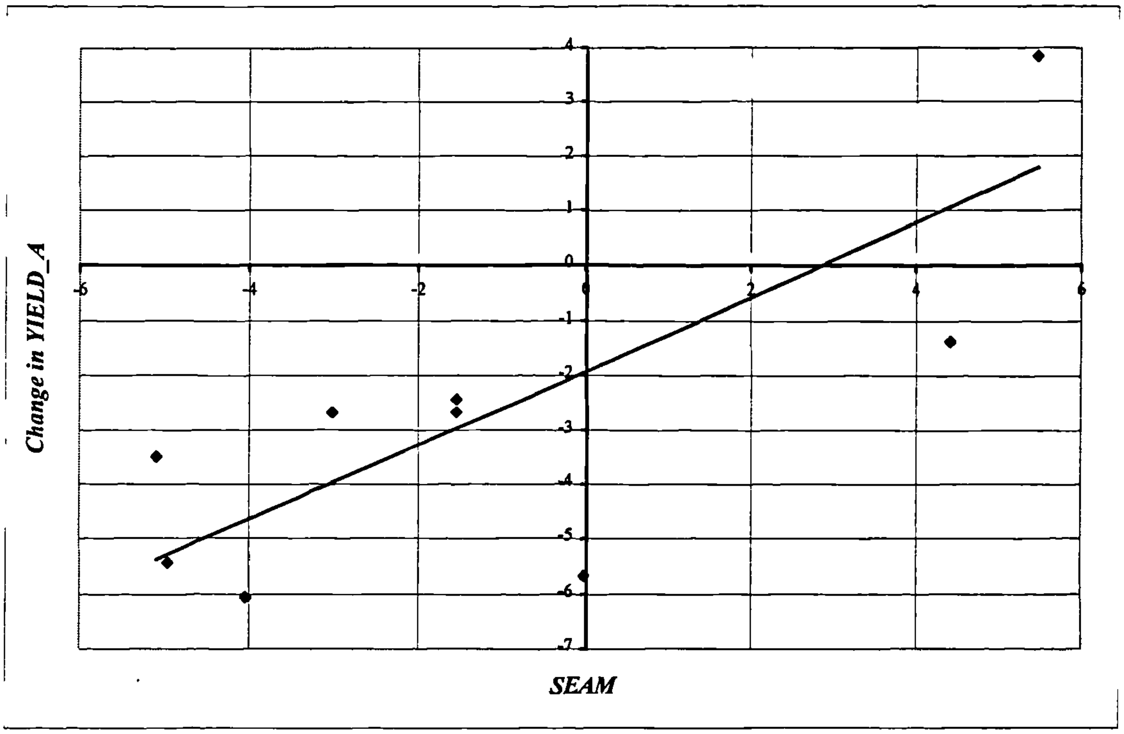


Figure 10.13 Relationship between change in alliance yield and degree of seamlessness *($R^2 = 0.63$)*

Indeed, increasing the level of competition by 1 causes alliance inter-hub passenger levels to fall by approximately 47. In terms of percentages, an increase of 1% in the level of competition leads to an 8% fall in alliance performance. Competitor reactions to alliance formation are analysed in greater depth in Chapter 11.

Owing to the variables' differing units of measurement, the regression coefficients can not be used to assess their relative importance. One means to do so is to calculate the standardised coefficients which, as a result of standardisation, are dimensionless. These coefficients are termed *beta coefficients* and Table 10.7 gives the ones for the significant variables in the alliance models.

		Beta coefficient	
Variable	**Linear model**	**Variable**	**Semi-log model**
ΔLCOM	0.965	*Ln(ΔNSIZE)*	0.899
ΔNSIZE	0.882	*ΔLCOM*	0.864
ΔHCAP	0.778	*Ln(ΔHCAP)*	0.615
NCOMP	0.300	*Ln(NCOMP)*	0.193
ΔTCONV	0.142	*ΔTCONV*	0.049

Table 10.7 Variable beta coefficients

In both of them, the change in effective network size and in the level of competition are the most important variables. This implies that these factors are the first ones to be given consideration by those airlines contemplating the alliance strategy. Following them in order of importance come network integration, the complementarity of networks of the potential partners and the convenience of travel offered by the alliance to travellers. The fact that network size has a higher beta coefficient than travel convenience indicates that passengers are willing to trade-off smaller improvements in waiting time against a wider choice of destinations. One of the possible reasons for that is that FFPs are now widespread industry practice and that travellers are seeking for airlines which can offer them a large enough network on which to collect and use points. This implies that having a joint FFP is a major asset for alliances, even though it is not accompanied by substantial decreases in waiting time.

10.7 Conclusion

Scope and density benefits of airline alliances are best measured by the change in passenger traffic between the partners' hubs. Of all the strategic alliance considered, the KLM-Northwest and British Airways-USAir alliances have produced the greatest benefits. Mathematical modelling of alliance performance indicates that network size, network complementarity, network integration, travel convenience and level of competition are the critical success factors of airline alliance success. In order of importance come network size and level of competition, followed by network integration, network complementarity and travel convenience. Surprisingly, the provision of seamless travel did not explain alliance success. However, further research is needed in that field.

11. MARKET POWER IN AIRLINE ALLIANCES

Introduction

The aim of this chapter is to analyse market power stemming from alliance formation in detail, and from that analysis, build mathematical models of alliance market power. As in the previous chapter, these models are useful in providing quantification of alliance success and in the identification of success factor variables. Furthermore they enable the verification of the validity of unsubstantiated beliefs concerning airline alliances. They can therefore be used as a management tool by airline managers and corporate strategists thinking of adopting the alliance strategy.

This chapter is divided into two main parts. In the first part, potential measures of alliance success are defined and their advantages and shortcomings are described. The location of measurement is selected as the inter-hub route and the origin-destination (O-D) market. The measure is then applied to three strategic alliances (EQA, British Airways-USAir and KLM-Northwest) to investigate whether they have been effective in increasing their market power, or whether they have not progressed substantially in that field since their formation.

The second part of the chapter deals with the formulation of the model of alliance market power. The selection of success factor variables is discussed and means of measuring those factors are devised. The market power models are then calibrated using two different regression techniques: linear and logit. It is deemed necessary to run the logit model because the linear model is complicated by the presence of simultaneity between variables. In addition, the logit model is more effective in separating alliance and competitor effects. The model results and implications are then discussed.

11.1 Market Power Measurement

In the airline context, market power is the ability of a carrier to deter entry of potential competitors or to decrease the competitiveness of those carriers already in the market. As noted in Chapter 9, it can exist on a route or within an airport, with a certain relationship between the two (Mauldin, 1989). The 'market power' theory put forward by Youssef (1992) to explain the emergence of airline alliances argues that alliances are strategic tools used by airlines to decrease the level of competition and therefore to preserve existing sources of economic rents. As a result, those airlines are able to enjoy supranormal profits, establish new market barriers and, in certain cases, continue their operational inefficiencies with the negative effects being felt by the consumer (such as fare increases unaccompanied by service quality enhancement).

11.1.1 Previous studies on airline market power

In order to decide upon and devise a suitable measure of alliance success, it is deemed important to review some of the literature pertaining to market power and its effects in the civil aviation industry. Many of the studies on market power were performed to investigate the effects of the spate of airline mergers and the formation of hub-and-spoke networks which followed airline deregulation in the US in 1978.

One such study was carried out by Borenstein (1989) who constructed econometric models to evaluate the effects of airport and route dominance. He used the price charged by the dominating airline as an indicator of the dominance exerted. Among the explanatory variables were airport and route market share as well as airport and route concentration. One of the findings of the study was that '....an individual airline's share of traffic on the route and at the endpoint airports seems to be a principal determinant of a carrier's ability to raise the price of its product' (Borenstein, 1989, p. 357). Concentration increases were also found to be of use in explaining the rise in fares. Furthermore, the econometric analysis revealed that the higher prices charged by the dominant airline did not allow other airlines in the market to raise their prices as well. Hence airport and route dominance seemed to insulate the dominant airline from competition. In another study, Borenstein (1990) used price, market share and service changes as measures of market power. The Northwest-Republic and TWA-Ozark mergers were used to show that the market power achieved was translated into higher prices, higher market share and reduced capacity to increase load factors.

Borenstein's initial work was furthered by Mauldin (1989) who attempted to shed light on the structural relationships between route dominance, market concentration and airport concentration in the US domestic marketplace. Fares were used as measure of market power. The statistical analyses revealed that fares were on average higher on routes with hubs at the endpoints than in non-hub markets. Lack of slots and space at hub airports, as well as the requirement for new entrants to enter on a large scale, were identified as sources of market power.

In an analysis of the competitive behaviour of US airlines and, at the same time, testing the contestability hypothesis, Bailey *et al* (1985) used price as a measure of market dominance. Their econometric model revealed a direct relationship between price, as measured by the average yield, and market concentration. The same approach was employed by Hurdle *et al* (1989) when investigating whether airline markets satisfy the conditions of perfect contestability. Their results confirmed market concentration to be of significance in explaining market power[75]. Other studies which have used fares as a reflection of market power include Morrison and Winston (1990) and Meyer and Oster (1987). In the former study, yields were observed to fall with increasing number of competitors, while in the latter, an increase in the level of competition lead to the availability of a greater choice of discount fares.

A more recent study by Belobaba and Acker (1994) analysed the changes in airline market concentration on a selected number of US O-D markets. An important finding of their study was that the formation of hub-and-spoke networks lead to both increased and decreased competition depending on the markets being analysed. Indeed, hub-and-spoke networks allowed airlines to compete effectively in connecting

[75]One variation of this study over that of Bailey *et al* (1985) is that the measure of market concentration incorporated the number of potential entrants in addition to the number of incumbents. This enabled a test of the contestability hypothesis pertaining to airline markets.

markets as they reaped the scope and density economies which those networks conferred. However, they also enabled the hub-dominating airline to reinforce its position, push out competitors and increase market concentration in markets originating or ending at a hub.

In an unpublished paper, Jorge-Calderon (1995) investigated market power issues on the European side using the same approach as in the US studies. Airline market power was, in that case, quantified as relative market share (that is, ratio of airline market share to competitor market share). The econometric model of market power revealed relative frequency share, relative plane size and relative economy fare to be the most significant explanatory variables. Youssef (1992) investigated the relationship between market concentration and fares in the airline alliance context basing himself on the EQA. Markets on which the EQA operated were observed to experience increases in concentration which were responsible for real fare increases.

From this review of studies, it would appear that market power results from a higher market share which in turn produces higher prices. Market share and fare therefore constitute appropriate measures of route market power and are selected for this study. As already noted, most of the studies mentioned above were carried out in the US context and, as such, did not suffer from lack of data. This study, however, deals with international airlines and routes for which collection of traffic and fare data is not so rigorous as in the US. Therefore, certain approximations have to be made in the quantification of market power. These approximations are considered next.

11.1.1.1 Market share

Ideally, the computation of market share should be based on actual passenger traffic in individual city-pair markets. For this research, the only appropriate source of such data is the *ICAO Digest of Statistics-Traffic by Flight Stage*. However, there are two major problems is making use of this data source. First, not all markets are listed so that it may be difficult to obtain a sample of routes large enough to justify the use of regression analysis. Second, some airlines have not reported their data though they operated on the routes. This has the result of inflating the market share of the alliance carriers. In order to circumvent the problem, market share will be substituted by frequency share. The assumption that frequency share approximates market share is based on previous work, notably that of Taneja (1968, 1981). Since this approximation is critical to the analysis in this chapter, a review of the main pieces of work in that context is presented.

The study by Taneja (1968) on the relationship between frequency share and market share involved the application of linear regression analysis to the following set of models:

$$MSHARE = f(FSHARE) \quad \textbf{(Eq. 11.1a)}$$

$$MSHARE = f(FSHARE,\ STIME) \quad \textbf{(Eq. 11.1b)}$$

$$MSHARE = f(FSHARE,\ N\_AIRLINES) \quad \textbf{(Eq. 11.1c)}$$

$$MSHARE = f(FSHARE,\ NOSTOP,\ ONESTOP,\ MTIME,\ N\_AIRLINES) \quad \textbf{(Eq. 11.1d)}$$

where *MSHARE* is the airline's market share, *FSHARE* is the airline's frequency share, *STIME* is the scheduled flying time, *N_AIRLINES* is the number of airlines in the market, *NOSTOP* is the number of non-stop flights, *ONESTOP* is the number of one-stop flights, and *MTIME* is the minimum flying time. The results of the regressions lead Taneja to conclude that market share depends almost completely on frequency share. No mention was however made as to the shape of the variation of the two quantities.

Shultz (1970) hypothesised that market share depends on frequency share, advertising share, demand, revenue, profit, and equipment innovations and tested a dynamic market share model involving four simultaneous equations containing those variables. Again, F and t tests at the 5% significance level revealed frequency share to be the only significant explanatory variable. Detzel (1971) attempted to improve the models of Taneja and Shultz by including a scheduling variable (the timing of the airline's departures relative to the departures of competing flights), passenger capacity of each flight in the market and the time-of-day travel distribution. His results confirmed that frequency share is the principal determinant of market share.

Basing himself on further empirical evidence, Taneja (1981) argued that the variation of market share with frequency share is in fact not linear, but is in the form of an *S*-curve, the location of which depends on the number of competitors in the market (see Figure 11.1). From this variation, one can deduce that the airline with the higher frequency share attracts more than a proportional share of the traffic. The *S*-curve variation is caused mainly by the existence of information costs (Levine, 1987; Miller III, 1979) which drive customers to contact the airline on which they have the highest probability of securing a seat at a convenient departure time, that is the airline with the highest share of departures.

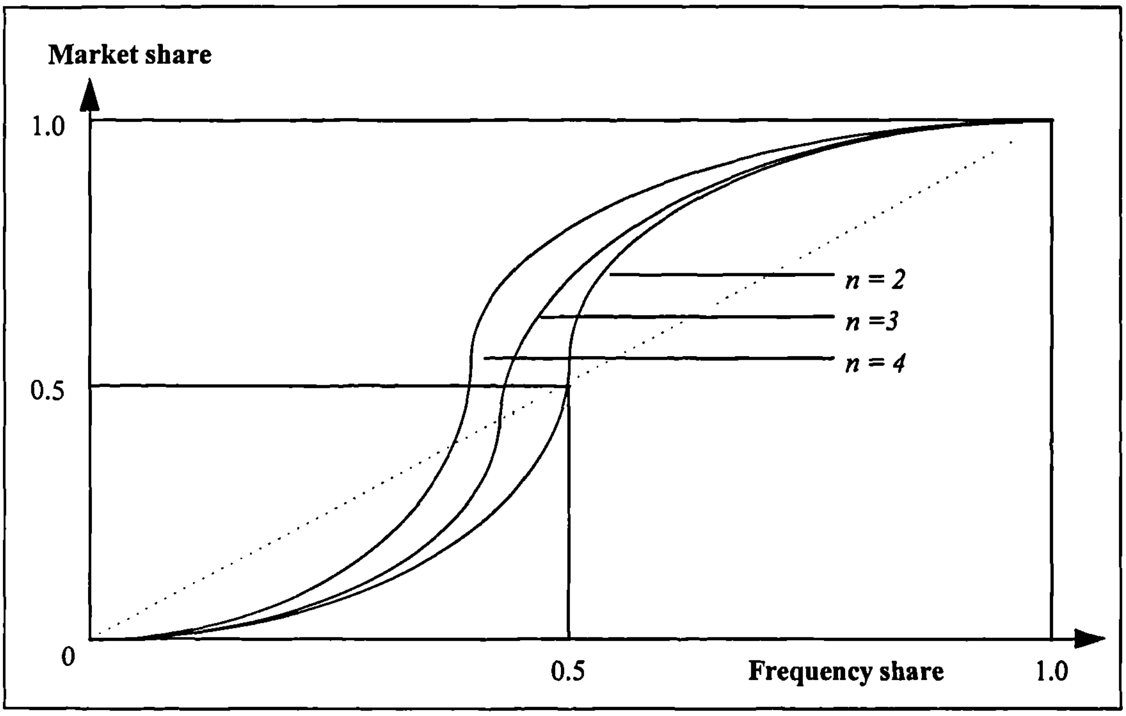


Figure 11.1 Variation of market share with frequency share
(n: number of competitors)
Adapted from Taneja (1981)

The theory of the *S*-curve has lead to the formulation of the following function describing the variation of market share with frequency share in a number of academic studies investigating either airline or airport market share[76]

$$MSHARE \approx FSHARE^{\alpha} \quad \textbf{(Eq. 11.2)}$$

[76] See for example Cohas *et al* (1995)

where α is a constant defining the shape of the curve. The belief that the competitor with the largest capacity share finds it easier to gain market share (which drives airlines to maximise their capacity share), has lead Miller III (1979) to investigate Equation 11.2 with capacity in place of frequency. Both cross-sectional and time-series regressions give values of α which are very close to unity[77]. Based on these studies and because of the unavailability of city-pair passenger traffic data, alliance market share is approximated by frequency share in this research:

$$MSHARE_A = \frac{FREQ_A}{\sum_{i=1}^{n} FREQ_i} \qquad \textbf{(Eq. 11.3)}$$

where A represents the alliance, i represents the services operating in the market and n is the number of services. Substitution of market share by frequency share has been used by Youssef (1992) with very satisfactory results. Service frequency is available from the *ABC World Airways Guide.*

11.1.1.2 Fare

Most of the studies on market power were carried out in the US domestic market where an abundance of data on fares is available. As Maillebiau and Hansen (1995) note, this is not the case for international operations where fare data can be obtained only from the *ABC World Airways Guide*. Two problems are encountered in using this data source. First, it is not very reliable in that it does not give the actual fares being paid. Indeed, owing to various unofficial discounts, the fares paid by consumers can differ, sometimes widely, from the published fares. In addition, the fare data is very complex with many different fare classes. Owing to the complex variety of published fares and the restrictions to which they are associated, the lowest unrestricted economy (*Y*) fares were selected for this study. However, they did not give conclusive results in the regression analyses, most probably because they were not representative of the actual fares paid, and were therefore discarded. A second restriction associated

[77] In the cross-sectional analysis, α lay within the range $1.007 < \alpha < 1.173$, and in the time-series analysis, α lay within the range $0.951 < \alpha < 1.054$.

with the use of the *ABC Guide* is that it does not list the fares to all the destinations considered in this research. The only fares which are consistently listed are those between the major hubs of the airlines.

Yield would have been a good approximation to fares. However, market power analysis is performed on inter-hub and on O-D markets (see section 11.2.1) so that the computation of yield requires data for the revenues and passenger traffic on those individual markets, such data being very difficult to obtain. Owing to these difficulties, fare was eventually dropped leaving market share as the only measure of alliance market power used in the mathematical modelling process.

11.2 Effects Of Alliances

The selected measure of alliance market power will now be applied to visualise how effective airlines have been able to increase their market power via alliances. However, prior to that, the markets to which the analysis will be applied have to be identified. The airline alliances to be included in the study also need to be selected.

11.2.1 Market selection

In the context of airline alliances, two market types are identified as potential candidates for assessment (refer to Figure 10.1):

(1) the inter-hub market (H_x–H_y) and

(2) the origin-destination (H_x–D) market.

The connecting hub-to-destination market (H_y–D) was also analysed. However, in the course of the analysis, methodological problems were encountered when determining the alliance market share in the H_y–D markets. This was because of the difficulty in determining which flights competed with the alliance owing to the Time Window constraints imposed for selection of connectable destinations (see Figure 10.8). Consequently, attempts to model the market share on H_y–D markets did not yield conclusive results. Another possible reason for that is the fact that a large number of hubs apart from H_x connect to the H_y–D routes and affect alliance market share there

(Figure 11.2). The H_y–D markets were therefore dropped from the analysis leaving the inter-hub markets and the O-D markets as analysis candidates.

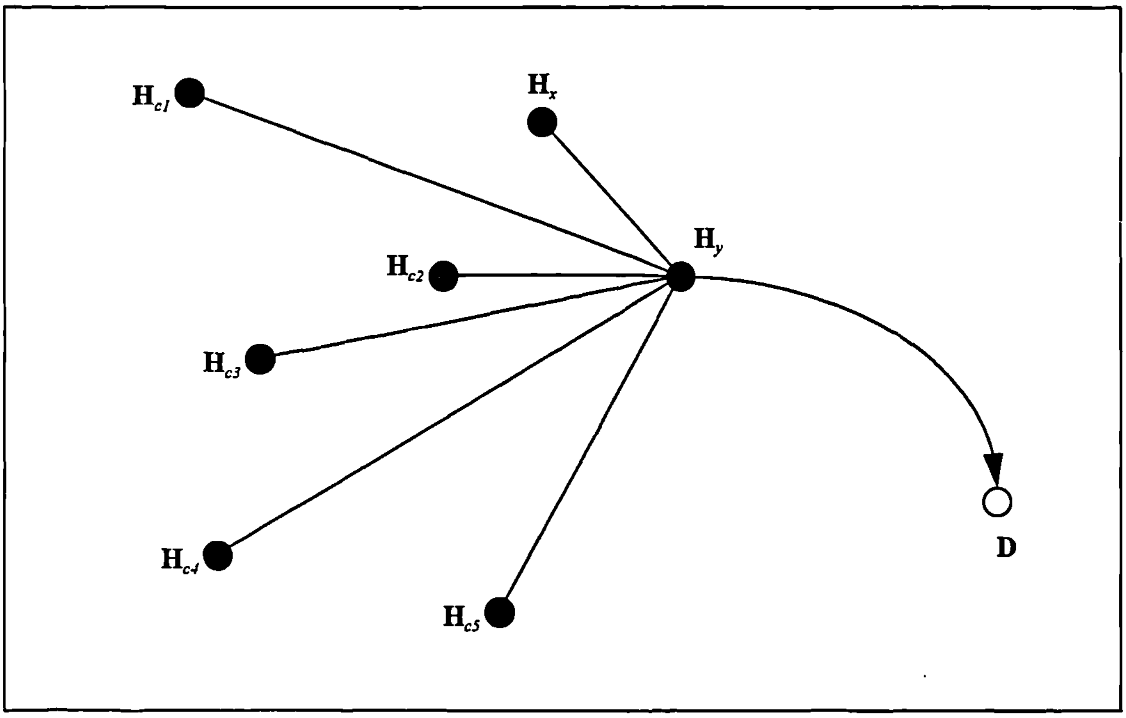


Figure 11.2 Hubs affecting traffic levels on H_y–D market
(H_c: *competitors' hubs*)

11.2.2 Alliance selection

To investigate the (possibly) different characteristics of regional and intercontinental alliances, the following alliances are selected for analysis:

(1) KLM–Northwest Airlines,

(2) British Airways–USAir, and

(3) EQA

The KLM–Northwest alliance is selected since it seems to be at an advanced stage of co-operation probably because of the antitrust immunity which it enjoys. It is compared to the British Airways–USAir alliance which is not protected from antitrust to identify whether antitrust immunity leads to different alliance characteristics. The EQA is chosen because it is the only European alliance having achieved an appreciable level of co-operation and which has been in existence for a sufficiently long time to enable the measurement of changes following alliance formation.

As in Chapter 10, the unit of analysis is the alliance. For example, if x_1 and y_1 are the market shares of SAS and Swissair respectively before the formation of the alliance, and x_2 and y_2 are their respective market shares after alliance formation, then the change in EQA market share is $(x_2 + y_2) - (x_1 + y_1)$. In the case of fares, the mean fare of the airlines in the partnership is taken.

Pre-alliance and post-alliance periods

As in Chapter 10, the measurement of alliance success is based on changes in the success variable from a selected pre-alliance period to a selected post-alliance period. For the EQA, the pre-alliance period is taken as the last week of June 1989 while for the KLM–Northwest alliance, it is taken as the last week of June 1991 in spite of the fact that the alliance already existed in 1989. This is because it was only in 1991 that the two airlines were granted the permission to perform their operations jointly. In addition, Northwest did not perform well in the years 1989 to 1991 leading KLM to write off its investment of $400 million in it. Therefore, alliance effects might not be apparent in the period 1989 to 1991. The pre-alliance period is also taken as the last week June 1991 for British Airways–USAir as that alliance came into existence in 1992. The post-alliance period for the EQA is taken as the last week of June 1994 as SAS moved out of the alliance after that. In the cases of KLM-Northwest and British Airways-USAir, the post-alliance period is taken as the last week of June 1995 when measurable alliance effects have been realised.

11.2.3 Effects in inter-hub markets

One would expect the inter-hub markets to be affected by alliance formation because the airlines in the partnership tend to dominate the airports at both ends of the market. As a consequence, the combined entity will be in a better position to prevent entry on a scale sufficient to constitute effective competition (Borenstein, 1989; Mauldin, 1989). The structure of international air transport itself also contributes in increasing the market power of the airlines in the partnership. Indeed, bilateral treaties between countries favour the designated carriers operating between international hubs. Any other carriers operating on those markets will be Fifth Freedom carriers which are restricted in their ability to compete. Alliancing between the designated carriers further reinforces their control of the inter-hub market so that they are in a better position to oust competitors out. The alliance between SAS and Swissair exemplifies the above argument. Swissair and SAS are the carriers designated to fly between Zurich and Copenhagen. In 1988 (prior to alliance formation), Thai and Alitalia provided Fifth Freedom service between those two hubs. In 1991, after the formation of the EQA, they terminated their service, leaving the SAS-Swissair combination in total control of the market. The following sub-sections analyse the changes in alliance market share and fare (wherever data is available) on alliance inter-hub markets. The effects of alliances on those variables is presented in graphical form; the data from which the graphs are constructed are provided in Appendix E.

11.2.3.1 Changes in EQA inter-hub markets

The inter-hub markets selected for the analysis of the EQA are given in Table 11.1 below.

H_x	H_y
Geneva	Copenhagen
Geneva	Oslo
Geneva	Arlanda (Stockholm)
Zurich	Copenhagen
Zurich	Oslo
Zurich	Arlanda
Vienna	Geneva
Vienna	Zurich
Vienna	Copenhagen
Vienna	Oslo
Vienna	Arlanda

Table 11.1 Hub combinations in market power analysis (EQA)

The examination of market power on inter-hub markets also includes fare changes because fares between hubs and major cities are consistently listed in the *ABC World*

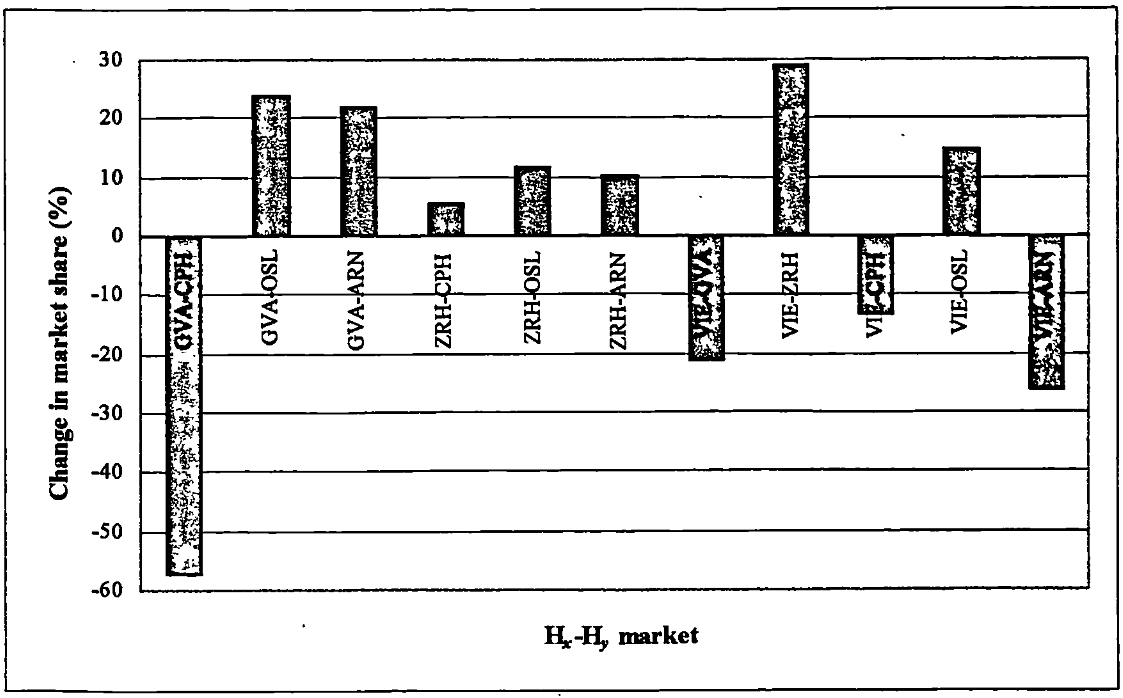


Figure 11.3 Change in EQA market share on inter-hub markets
Data source: ABC World Airways Guide

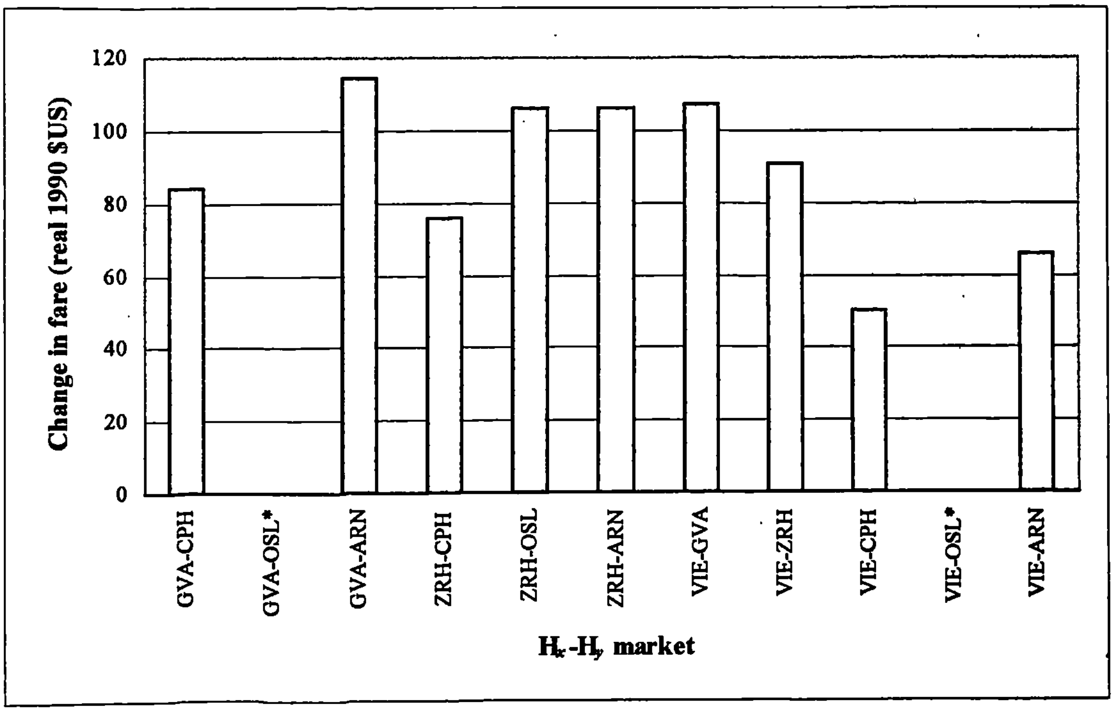


Figure 11.4 Change in EQA fares on inter-hub markets
Data source: ABC World Airways Guide
Note: Fare data for Geneva-Oslo and Vienna-Oslo is not available

In seven of the eleven inter-hub markets, the market share of the EQA increased, while real fares rose in all the markets for which data was available.

One could argue that the changes in market share and fares were not caused by the alliance but by other factors in the competitive environment. To test whether that the changes in the variables can be traced back to the formation of the alliance, comparison of variable means is made between two time periods, one which experienced alliance formation (1989-1994) and one which did not (1984-1988). A difference in means significant at the 5% level is obtained (see Table 11.2) which allows the rejection of the hypothesis that the alliance is not responsible for the increase in inter-hub market share and fares.

Market power variable	$t_{\alpha = 0.05}$	*t*-statistic
Market share	2.086	3.245
Fare	2.262	2.641

Table 11.2 Results of *t*-tests for alliance market power variables (EQA)

11.2.3.2 Changes in British Airways-USAir and KLM-Northwest inter-hub markets

The inter-hub markets selected for the market share analysis of the British Airways-USAir and KLM-Northwest are given in Table 11.3.

H_x	H_y
Amsterdam	Boston
Amsterdam	Detroit
Amsterdam	Minneapolis
London	Boston
London	Charlotte
London	Los Angeles
London	New York
London	Philadelphia
London	Pittsburgh

Table 11.3 Hub combinations in market power analysis (BA-US and KL-NW)

The changes in market share and real fares of the alliances are shown in Figure 11.5 and Figure 11.6 respectively.

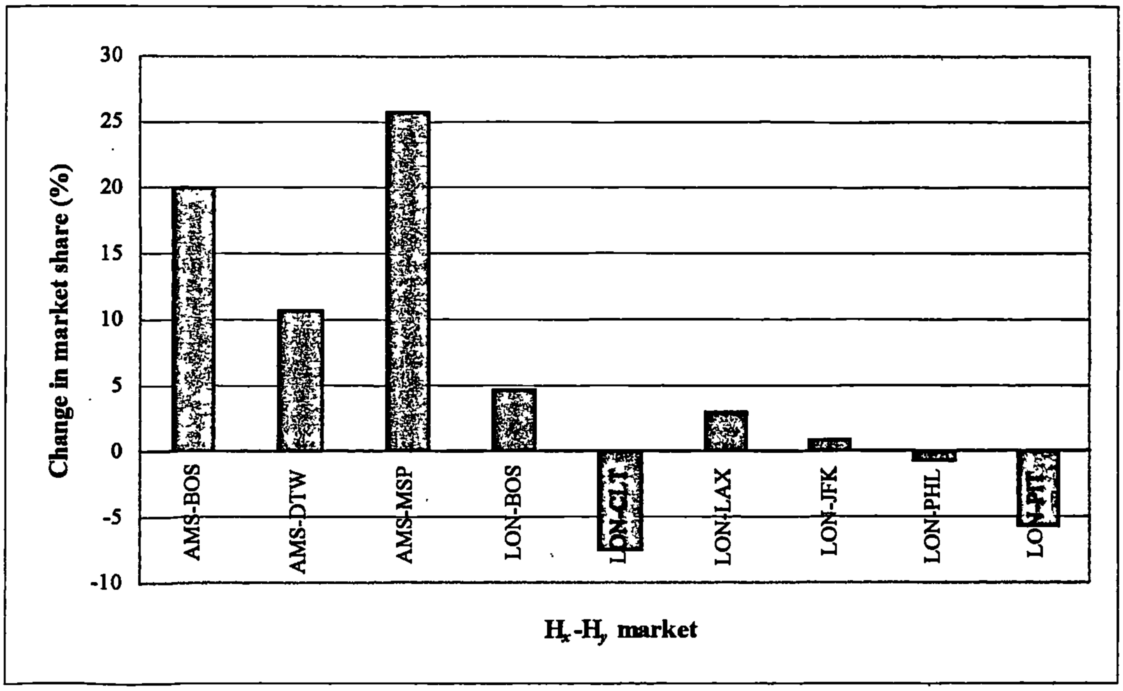


Figure 11.5 Change in inter-hub market share of transatlantic alliances
Data source: ABC World Airways Guide

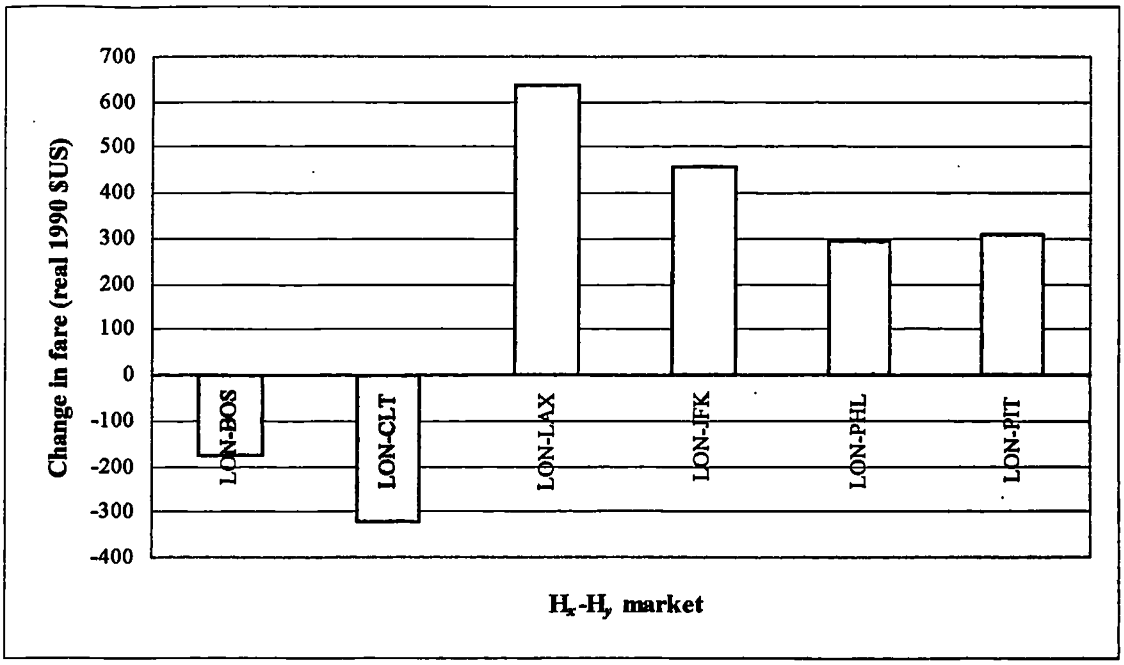


Figure 11.6 Change in British-Airways-USAir transatlantic fares
Data source: ABC World Airways Guide
Note: Fare data for KLM-Northwest is not available

Both alliances had the expected effect of increasing market share and fares in most of the inter-hub markets considered. A point of interest is the fall in fares on the London-Boston market which could be explained by an increase in competition at an alliance level between British Airways-USAir and KLM-Northwest, Boston being one of the US connect point of both European airlines. However, Virgin Atlantic could also be responsible for that. Figure 11.5 indicates that the KLM-Northwest alliance has been the more effective of the two as it has benefited from larger increases in market share that the British-Airways alliance. This can be attributable to the antitrust immunity enjoyed only by the KLM-Northwest alliance which allows it greater scope in its co-operation.

As in the case of the EQA, the null hypothesis that alliance formation has not caused the observed changes in market power variables is tested. Variable means for the periods 1991-1994 and 1984-1988 are compared using a Student's t test. The results of the statistical test are given in Table 11.4. They show that the null hypothesis can be rejected so that the alliance has effectively lead to an increase in the market power of the allied airlines on the transatlantic inter-hub markets.

Market power variable	$t_{\alpha=0.05}$	t-statistic
Market share	2.120	3.265
Fare*	2.228	3.721

Table 11.4 Results of t-tests for alliance market power variables (transatlantic)

*Fare data is for British Airways-USAir only

11.2.4 Effects in Origin-Destination markets

Though the domination of the inter-hub market is an important objective of allied airlines, the main thrust of the alliance strategy is to gain market power in O-D markets as a substantial part of traffic is of O-D nature, using H_y merely as a connecting point. There is no point in being a strong airline only in the inter-hub sector of the flight when the airline's passengers are transferring to a competing carrier at the connecting hub on their way to their destination. Furthermore, only by having a strong presence in O-D markets can airlines benefit from network economies of scope and exert price leadership. This sub-section examines how the market share of the selected alliances has changed in O-D markets.

11.2.4.1 Identification of competing services

The identification of competing services is not as straightforward as in the case of inter-hub markets. For O-D markets, the alliance service is taken to be both the on-line and/or interline services involving the airlines in the partnership. Competing services are either non-stop or those which are routed via hubs other than the alliance connect point (H_y). Both on-line and interline services are considered to compete with the alliance. The services are identified in the *ABC World Airways Guide.* Figure 11.7 illustrates the above definitions. On the Boston-Barcelona O-D market, the United Airlines-Iberia and Delta Airlines-Iberia interline services, and the Sabena, Lufthansa and British Airways on-line services all compete with the KLM-Northwest interline (code-shared) service.

It is recognised that an infinite number of connections are possible for any city-pair. For example, passengers from Boston on their way to Barcelona can be routed via Philadelphia, Montreal or Paris. The ones listed in the *ABC World Airways Guide* are only those which have been paid for by airlines. Therefore, 'good' connections which involve short connect times are not necessarily listed in the *ABC Guide*. However, one can argue that publication of a flight in the *ABC Guide* conveys some kind of a marketing advantage to the airline as the *ABC Guide* is still widely consulted by travel agents in spite of the advent of the CRSs[78]. As a consequence, it is very unlikely for the travelling public to be aware of flights which are not listed in the *ABC Guide*. These flights do not compete effectively with the alliance and do not affect its market share dramatically, hence justifying the use of the *ABC Guide* for the identification of competitors.

[78] According to Mr. Ricky Mack of the Reed Travel Group, the *ABC World Airways Guide* and the *OAG* are still widely used in the Western world. Furthermore, the *OAG* distributes part of its information to CRSs and to business travellers in the form of small guides and computer discs so that they can effectively dictate the flights they want to the travel agent. This further justifies the use of the *ABC Guide* for this piece of research (Lecture by Mr. Ricky Mack, Cranfield University, October 17, 1995).

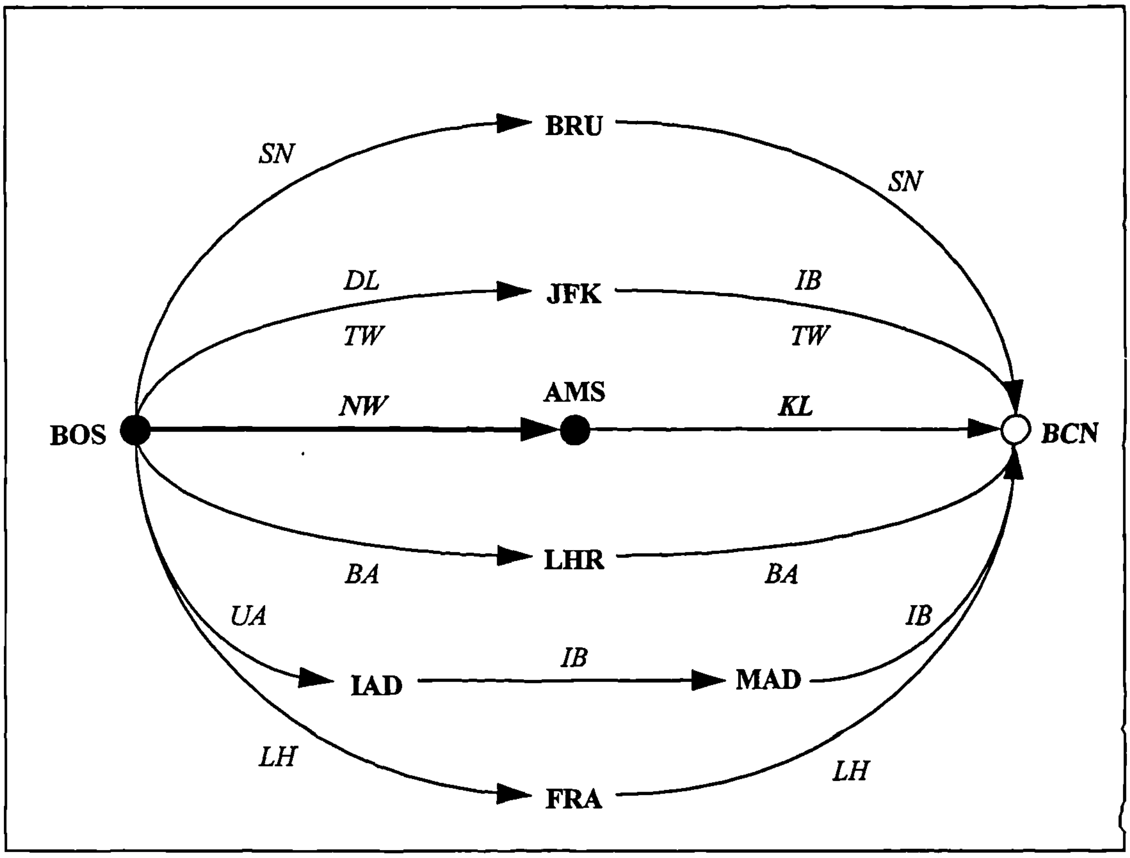


Figure 11.7 Competing flights on the Boston-Barcelona O-D market in June 1994
Source: ABC World Airways Guide, June 1994
Key:
AMS: Amsterdam; BCN: Barcelona; BOS: Boston; BRU: Brussels; FRA: Frankfurt; IAD: Washington, Dulles; JFK: Washington, JFK, LHR: London, Heathrow; MAD: Madrid; BA: British Airways; DL: Delta, IB: Iberia, KL: KLM; LH: Lufthansa; NW: Northwest; SN: Sabena; TW: Transworld Airlines; UA: United Airlines

11.2.4.2 Selection of O-D markets

Again, the assessment of the effectiveness of the alliances is based on *changes* from the defined pre-alliance and post-alliance periods. This criterion determines the selection of O-D markets to be included in the analysis. Using the *ABC Guide*, the O-D markets serviced by the airlines in the partnership (intraline, interline or code-shared) both in the pre-alliance and post-alliance periods are identified. Having a sample of O-D markets which were served in both periods enabled market share changes to be computed. The selected origins and connecting points for the EQA and the transatlantic alliances are given in Table 11.5. The O-D markets for these hub combinations are given in Appendix F.

Airline alliance	Origin (H_x)	Connecting point (H_y)
KLM-Northwest	Boston	Amsterdam
	Minneapolis	Amsterdam
	Amsterdam	Boston
		Detroit
		Minneapolis
British Airways-USAir	London	Baltimore
		Boston
		Charlotte
		Los Angeles
		New York
		Philadelphia
		Pittsburgh
	Philadelphia	London
EQA	Copenhagen	Geneva
		Vienna
		Zurich
	Vienna	Geneva
		Copenhagen
		Oslo
		Stockholm
		Zurich
	Zurich	Copenhagen
		Oslo
		Stockholm
		Vienna

Table 11.5 Origins and connecting points for alliance O-D markets

Though Detroit is an important hub of the KLM-Northwest alliance, it is not considered in the analysis because its sample of O-D markets which existed in both the pre-alliance and post-alliance periods was too small. This was also the case for most of the USAir hubs which left Philadelphia as the only US origin for the British Airways-USAir alliance. For the same reason, only Copenhagen is taken as origin for SAS.

11.2.4.3 Alliance market share changes in O-D markets

The change in the average O-D market share for each of the origins is given in Figure 11.8. Fare changes are not considered because of the unavailability of fare data in O-D markets.

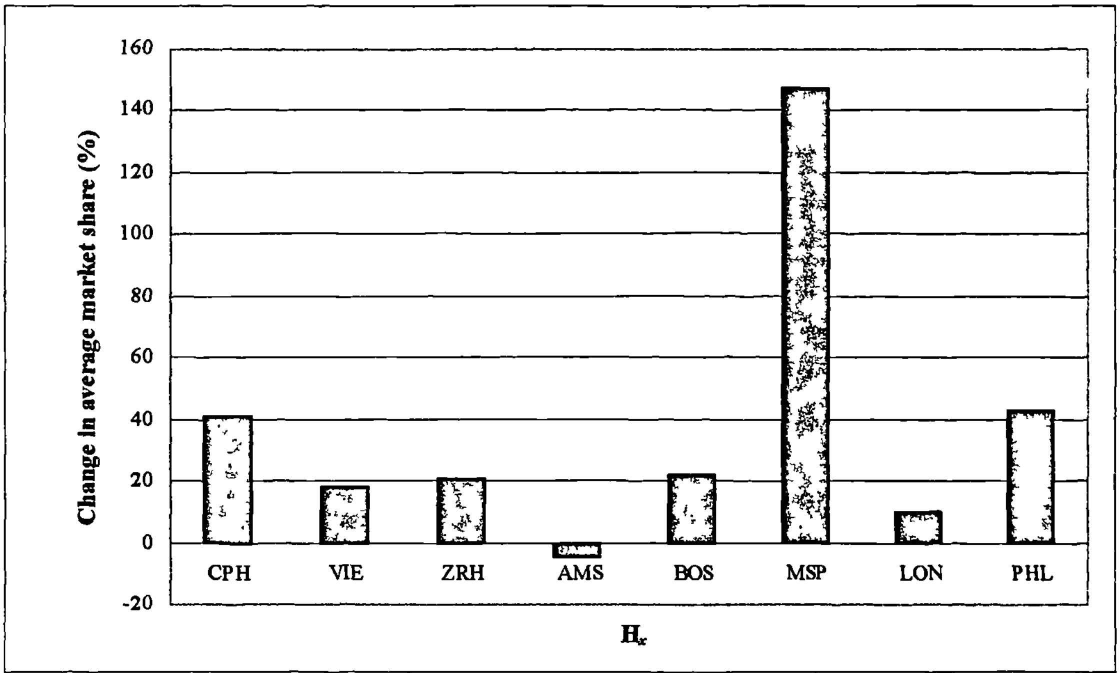


Figure 11.8 Change of alliance average market share in O-D markets
Data source: ABC World Airways Guide

For all the origins, with the exception of Amsterdam, the average market share of the alliances in the O-D markets increased over the period in which the alliances became operational. The changes for the EQA are generally similar for all three hubs considered and lie in the range of 17% (Vienna) to Copenhagen (41%). Market share for the transatlantic alliances vary quite dramatically in magnitude. The KLM-Northwest O-D markets originating from Amsterdam actually experienced a slight decrease in average market share (4%). Minneapolis was, by far, the most effective origin with the KLM-Northwest alliance benefiting from a 149% increase in average market share. The result for London was modest (10.5%). Taken together with Amsterdam's result, it would indicate that the alliances experienced difficulty in increasing their market share in O-D markets originating from European hubs. A possible explanation could be the increased competition between the two transatlantic alliances considered, with the effects of SAS-Continental, Swissair-Delta and Lufthansa-United entering the equation.

In brief, the analysis has shown that the alliances considered have been able to enhance their market power with varying degrees of success. The question which now arises is what are the factors which cause the variation in the degree of success, that is which affect the ability of airlines to increase their market power via alliances. The next part of this chapter will address this question in depth.

11.3 Alliance Inter-Hub Market Power

Market power on routes which have hubs at both endpoints has been extensively researched by Borenstein (1989) and Mauldin (1989). The main finding of these studies have shown that such markets are very likely to have fares which are higher than comparable markets which just originate from a hub or which have no hubs at their endpoints. Airport dominance was found to be a decisive factor in explaining the market power of the dominant airlines on markets via hubs. Hence, regulatory bodies were recommended to give due consideration to the concentration at the hubs of the airlines seeking merger approval.

An alliance creates a situation analogous to merging in that the hubs at both ends of the inter-hub market become dominated by a single entity, namely the alliance. Prior to alliance formation, the hubs at the ends of the market were each dominated by one carrier only with both competing against each other. The extent to which the alliance can be considered as a single entity is however open to discussion, though the level of integration is certainly not as high as in a merger. Nevertheless, the domination of the airports at both ends of the route does act as a deterrent to entry since it is difficult for the new entrant to enter at the minimum scale necessary to compete effectively in such a situation. This argument also applies to the non-allied carriers already in the market which suddenly have to face a more formidable competitor. This weakening of their position eventually leads them to abandon the market, resulting in an increase in the alliance market share. The change in the number of competing services from to 1994 on the EQA and transatlantic inter-hub routes are shown in Figure 11.9 and Figure 11.10 respectively.

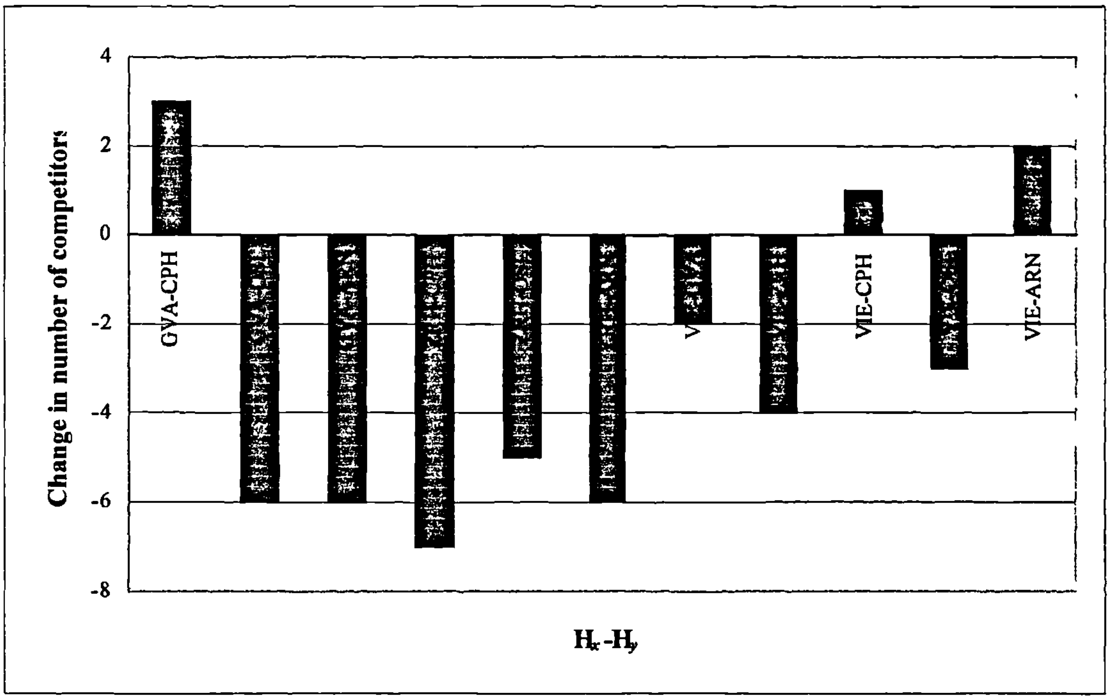


Figure 11.9 Change in the number of competitors to the EQA on inter-hub routes
Data source: ABC World Airways Guide

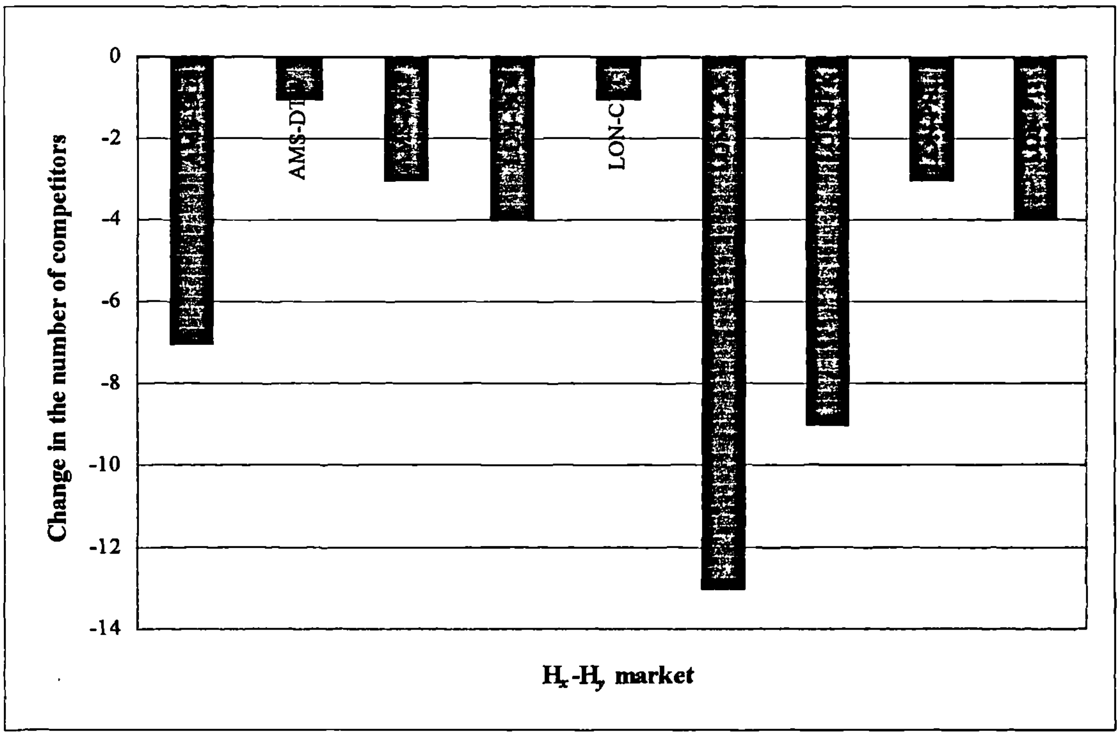


Figure 11.10 Change in the number of competitors on transatlantic inter-hub markets
Data source: ABC World Airways Guide

In eight of the eleven markets, the number of services competing with those of the EQA fell, while the level of competition on all transatlantic markets decreased. This evidence confirms how effective alliances are in driving competition out of inter-hub markets.

However, in the context of airline alliances, there are other factors apart from airport dominance which increase the market power of airlines on inter-hub markets. In order to identify those factors, it is important not to restrict oneself to the inter-hub market only, but to look at the broader picture which is the O-D market with the connection at H_y. In order to keep connecting travellers on the alliance network, the airlines in the partnership usually attempt to increase their service frequency[79], decrease their connect time and make use of code-sharing and combined FFPs. These increase the probability that the alliance service from H_x to D is going to be selected by a traveller rather than other competing services. Consequently, alliance strategies implemented to promote its O-D service also increase the attractiveness of the alliance inter-hub flight to the detriment of competitors' services between the same two hubs.

This section has identified hub dominance at both ends of the inter-hub market as one of the factors affecting alliance inter-hub market share. Other alliance success factors are effects on O-D markets which spill over the inter-hub market. The next section will be concerned totally with the O-D markets since factors affecting the market power of the alliance in those markets are very likely to have a simultaneous effect on its inter-hub market power.

11.4 Alliance Market Power In O-D Markets

The factors affecting the market power of alliances in O-D markets can be classified as either alliance-specific or competitor-specific. They are identified in Figure 11.11. The reasons for the inclusion of those particular variables as well as their measurement are considered next.

[79] However, when the objective of the alliance is to decrease costs, a decrease in service frequency may occur as the airlines rationalise their capacity on the inter-hub route.

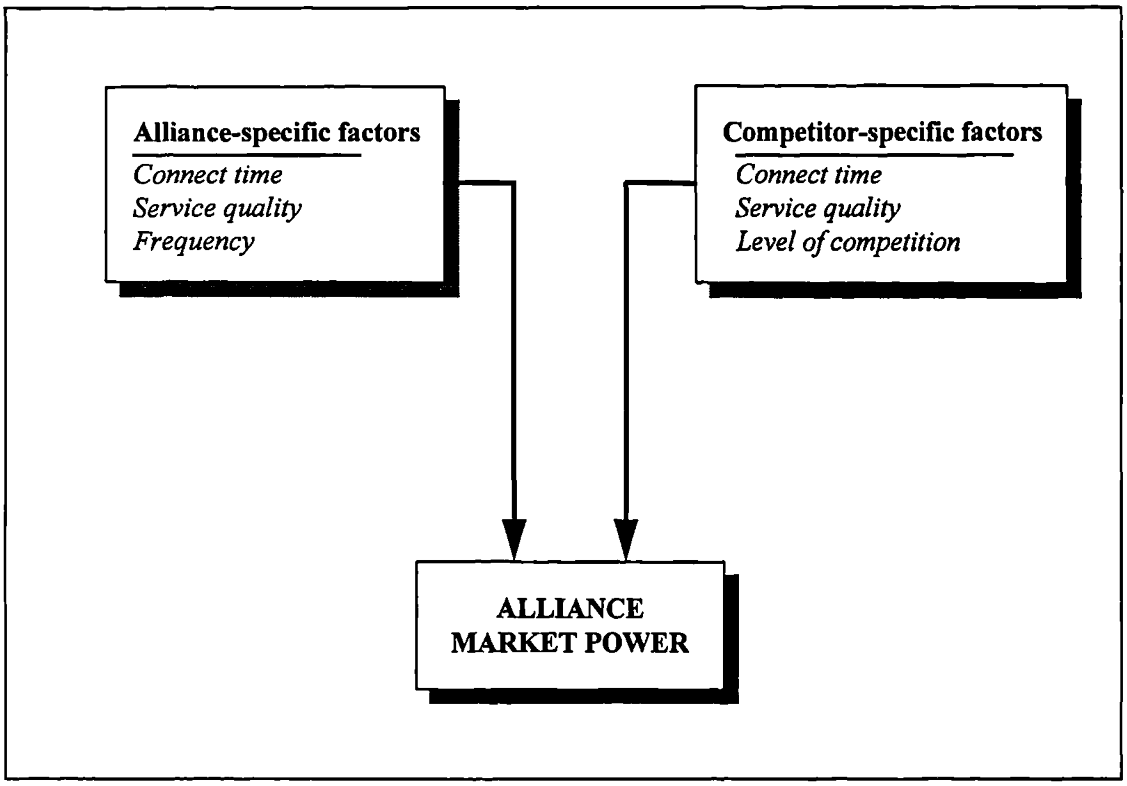


Figure 11.11 Factors affecting alliance market power

11.4.1 Connect time

The connect time is the time period between the incoming H_x–H_y flight and the H_y–D flight. Basically, it is the length of time a passenger has to wait for his/her connecting flight. Since it contributes to the total elapsed time from origin to destination, connect time can be regarded as influencing the costs of air travel to the consumer (Abrahams, 1983). It is anticipated that the alliance partners will attempt to decrease the connect time to make their flight more attractive and to promote their flight option on CRS' displays, and eventually increase their market share. Evidence of the relationship between airline demand in O-D markets and waiting time is provided by Ippolito[80]

[80] The waiting time in the model consisted of frequency delay, which is the difference between the desired and offered departure times, and stochastic delay which is the waiting time consequent to the unavailability of a seat on the desired flight.

(1981) using a complex regression model. The alliance connect time is the time interval between the arrival of the H_x–H_y flight and the departure of the H_y–D flight[81].

The alliance move to improve its connections can engender a reaction from the competitors fearing to lose market share, hence the incorporation of a variable quantifying the competitor attractiveness in terms of waiting time. Considering the large number of competitors in O-D markets, it is difficult and time-consuming to include the connect time values of all the competitors individually. Therefore, all the competitors are considered together and an aggregate variable is produced. This variable is the average competitor connect time ($\overline{CTIME}_C$) defined as follows:

$$\overline{CTIME}_C = \frac{\sum_{c=1}^{n}\left(\frac{1}{FREQ_c} \times ctime_c\right)}{\sum_{c=1}^{n}\left(\frac{1}{FREQ_c}\right)} \qquad \textbf{(Eq. 11.4)}$$

where subscript 'c' denotes the competing service, $FREQ_c$ is the frequency with which that service is operated, *ctime* is the connect time and n is the number of effective competitors in the market. The connect time is weighted by the reciprocal of the frequency to give a higher penalty to infrequent services. This is because a high service frequency contributes to lowering waiting time at the connecting point in the network owing to the availability of a wider choice of flight times and of lower load factors. This increases the probability of obtaining tickets near to departure times (Abrahams, 1983; Anderson and Kraus, 1980; De Vany, 1975; Douglas and Miller III, 1974; Ippolito, 1981).

11.4.2 Quality of service

A factor which affects passenger choice of airline is the quality of service, which is defined here as whether the service offered involves an on-line or interline connection, and whether it is non-stop, involves only one stop or multiple stops. On-line

[81] Strictly speaking, the actual passenger waiting time is the time interval defined above, from which is subtracted the airport minimum connect time. However, the passenger has no notion of the minimum connect time and his/her choice of service is influenced only by the total time for which he/she is on ground at the connecting point.

connections are preferred to interline connections by passengers mainly because they are associated with a smaller risk of baggage loss and less 'transition friction' (Youssef and Hansen, 1994), that is less hassle and shorter walking distances when transferring from one flight to the other. Non-stop services are rated higher by travellers over one-stop services, which are in turn rated better than multi-stop services because of the lengthy time and circuitous routings which are involved in them.

It was initially attempted to quantify service quality of the alliance and of its competitors using the Boeing Quality of Service Index (*QSI*) market share model (Boeing, 1989). This model takes into account the dependence of flight attractiveness on the number and type of stops using a quantity termed 'stop factor'. However, application of this method turned out to be too lengthy owing to the large number of O-D markets under consideration. Based on Kanafani and Ghobrial (1985), the flight option is represented by a dummy variable (*quality*) taking the following values:

$quality_{A,c}$ = *1.0 for one-stop on-line connection*

0.5 for one-stop interline connection

0.25 for multi-stop interline connection

where subscripts *A* and *c* refer to the alliance and its competitors respectively[82].

Though one could argue that these values are arbitrarily selected, the actual value is not critical. Rather, they are meant to differentiate between the various flight types and attach a greater weighting to those having a greater appeal to the consumer.

11.4.2.1 Alliance service quality

This piece of research restricts itself to inter-hub markets and alliance O-D markets involving only one stop. Prior to alliance formation, the partners-to-be offered either

[82] This approach was also adopted by the US Civil Aeronautics Board in devising the *QSI* Model 1 for analysis of market share. In this study, the flights were weighted as follows:
non-stop flights: 1.0,
one-stop flights: 0.55,
two-stop flights: 0.40,
three-stop flights: 0.20, and
more than three stops: 0.03 (Boeing, 1989).
The values were chosen based on experience.

on-line connection or basic inter-line service on the O-D markets. Following the sealing of the partnership, a widely-used tool used by alliances to provide improved service quality is code-sharing. The marketing advantages of code-sharing have been elaborated upon extensively in Chapter 6. In brief, the practice of code-sharing on the H_y–D route will effectively convert the interline service between the partners to on-line service, that is making it seem to potential travellers that no change of airline is involved in the trip. Promotion to on-line status pushes the alliance flight option to better CRS positions. Code-shared routes will therefore be considered equivalent to on-line service in this study. The alliance service quality ($QUALITY_A$) is therefore given by

$QUALITY_A = 0.5$ *if the connection is interline, and*

$QUALITY_A = 1.0$ *if the connection is intraline or code-shared.*

11.4.2.2 Competitors' service quality

Since the strategy of the alliance is to raise its flight quality above that of its competitors, it is necessary to include a variable for the attractiveness of the competitor flights in the model. The competitors' flights can be either of the following four types:

(1) Non-stop

(2) Code-shared, where the competitor is another alliance. This is the case mostly on transatlantic flights where the KLM-Northwest, British Airways-USAir and Lufthansa-United compete, alongside with other less developed alliances such as SAS-Continental and Swissair-Delta.

(3) On-line connection with only one stop

(4) Interline connection with only one stop

(5) Interline connection with multiple stops.

The non-stop flights are of better quality than that of the alliance and represent the greatest opposition to it. Then come the on-line and code-sharing services which are of comparable quality to that of the alliance. They are followed by the basic interline service with one stop followed by the interline service with multiple stops in order of decreasing attractiveness.

Quantification of competitor service quality is as follows:

$quality_c =$ *1.5 if the service is non-stop,*

1.0 if the service is intraline or code-shared

0.5 if the service is interline with only one stop, and

0.25 if the service is interline with multiple stops.

As in the measurement of competitor connection time, it would be too lengthy to consider each competitor individually so that an aggregate measure is proposed. This measure, $\overline{QUALITY}_C$ is defined as

$$\overline{QUALITY}_C = \frac{\sum_{c=1}^{n}\left(FREQ_c \times quality_c\right)}{\sum_{c=1}^{n} FREQ_c} \qquad \textbf{(Eq. 11.5)}$$

The variable $quality_c$ is weighted by the service frequency since it is in itself an important quality variable. For example, a daily interline service can attract a larger amount of traffic than a weekly on-line service owing to the greater schedule flexibility which it offers to consumers.

11.4.3 Level of competition

Basing himself on empirical data, Taneja (1981, p. 143) notes that '....the *S*-curve is a function of the number of competitors in the market' implying a change in alliance market share with a change in the number of competitors. This can be observed in Figure 11.1 where the curve is observed to shift as the number of competitors in the market increases from two to four, resulting in a decrease in airline market share. Therefore, a variable for the change in the level of competition experienced by the alliance needs to be included in the market power model. In this study, the total frequency of the competitors is used to measure the O-D level of competition:

$$LCOM_F = \sum_{c=1}^{n} FREQ_c \qquad \textbf{(Eq. 11.6)}$$

where n is the number of competing services. The frequency weighting is applied as passengers are known to be heavily responsive to service frequency.

11.4.4 Market concentration

Belobaba and Acker (1994, p. 7) define market concentration as 'the number of firms that sell a particular product or collection of closely-related products in a market and the distribution of the firms' sizes in terms of sales'. A review of the relevant air transport studies indicates that market concentration contributes to bringing market power. Bailey *et al* (1985); Call and Keeler, (1983), Hurdle *et al* (1989) and Mauldin (1989) all provide empirical evidence of a linear relationship between market concentration and yields/fares. However, Evans and Kessides (1993) find consistent results between yields and demand variables while omitting the market concentration variable in their models. Borenstein (1989) includes both market share and market concentration variables in his models of market power and finds that both are of value in explaining price variations.

Youssef (1992) investigated the effects of market share and market concentration in the EQA O-D markets and found a positive relationship between changes in alliance frequency share and market concentration, with the alliance's ability to influence market concentration via service frequency changes increasing after alliance formation. Market concentration was also found to have a significant influence on fares. Alliance dummy variables and market concentration were observed to be highly correlated leading Youssef to conclude that alliance formation has an important effect on market concentration.

The effect that market concentration has on alliance market share is shown in Figure 11.12 which is a plot of the change in the average market share of the selected alliances against the change in the average market concentration in the O-D markets. A linear relationship can be observed between alliance market share and market concentration indicating that alliance market share increases with increasing market concentration. Further evidence of the relationship between the change in alliance market share and the change in market concentration in O-D markets is provided in Appendix G which contains disaggregate plots of those quantities for each of the hub combinations in this study.

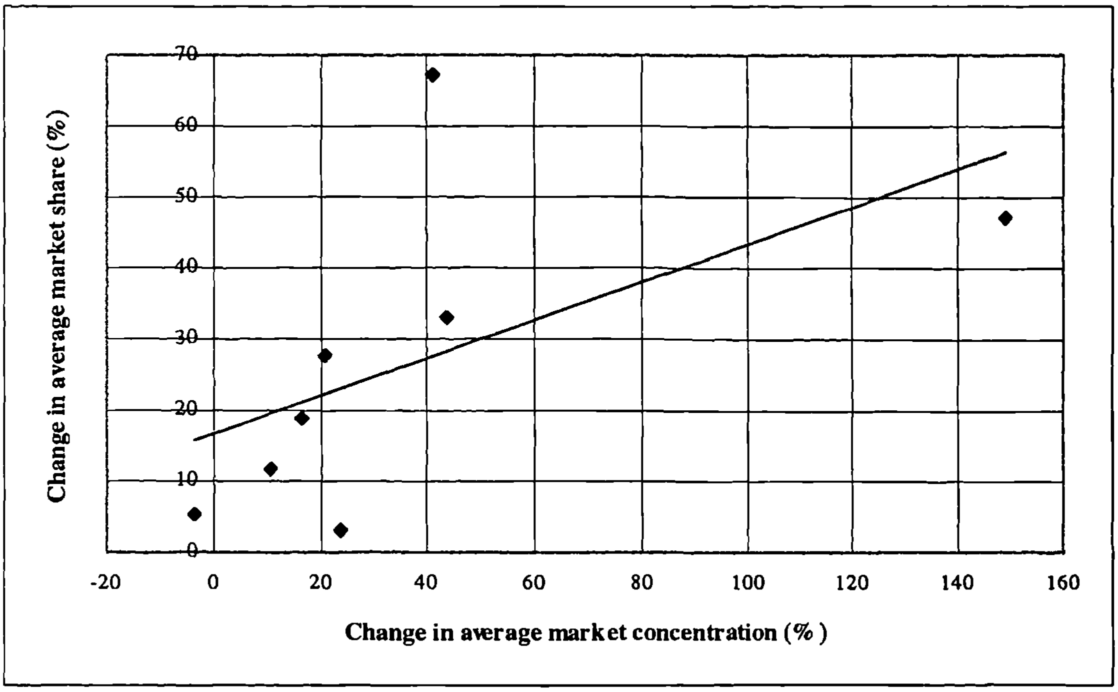


Figure 11.12 Variation of the change in average alliance O-D market share with the change in average O-D market concentration
(r = 0.576)

This evidence coupled with that from the above-mentioned studies confirms that market concentration has to be considered in the market power model. However, there seems to be a lack of clarity as to how market concentration fits into the interaction between market share, market power and yields. On the one hand, studies show that market concentration is directly related to market share and yields while on the other hand, it is considered to be an endogeneous[83] variable in the market share models. For example, Youssef (1992, p.79) concludes from his study that '...the impact of alliances on fares is an indirect one, with market concentration the intervening variable'. Market concentration will be introduced into the model to investigate its behaviour.

11.4.4.1 Measure of market concentration

Various measures of market concentration exist: the *K*-firm concentration ratio, the Gini Index and the Herfindahl-Hirschman Index (*HHI*). However, there is no consensus on which one is the best. The *HHI* is selected for this study since it is the

[83] That is a variable causally dependent on other independent variables in the model.

one most commonly used in air transport studies[84] on market and airport concentration. Furthermore, it attaches more importance to the large firms in the market under the assumption that large firms have more market power. This, according to Laine (1995), is very appropriate since it takes the customer's viewpoint of market concentration. *HHI* is defined as the sum of the square of the market share values of the carriers (*i*) operating in the market

$$HHI = \sum_{i=1}^{n} (MSHARE_i)^2 \qquad \textbf{(Eq. 11.7a)}$$

Since data for market share is unavailable, it will be substituted for by frequency share:

$$HHI_F = \sum_{i=1}^{n} (FSHARE_i)^2 \qquad \textbf{(Eq. 11.7b)}$$

11.5 Variable Changes

As a preliminary stage in the analysis, the changes in the model variables from the pre-alliance period to the post-alliance period are analysed. This will provide an insight into the extent to which the alliances strategies have been implemented and the reactions of the competitors. The changes in the averages of the variables in the market power model for the EQA and the transatlantic alliances are given in Figure 11.13 and Figure 11.14 respectively.

[84] See, for example, Belobaba and Acker (1994) and Hurdle *et al* (1989).

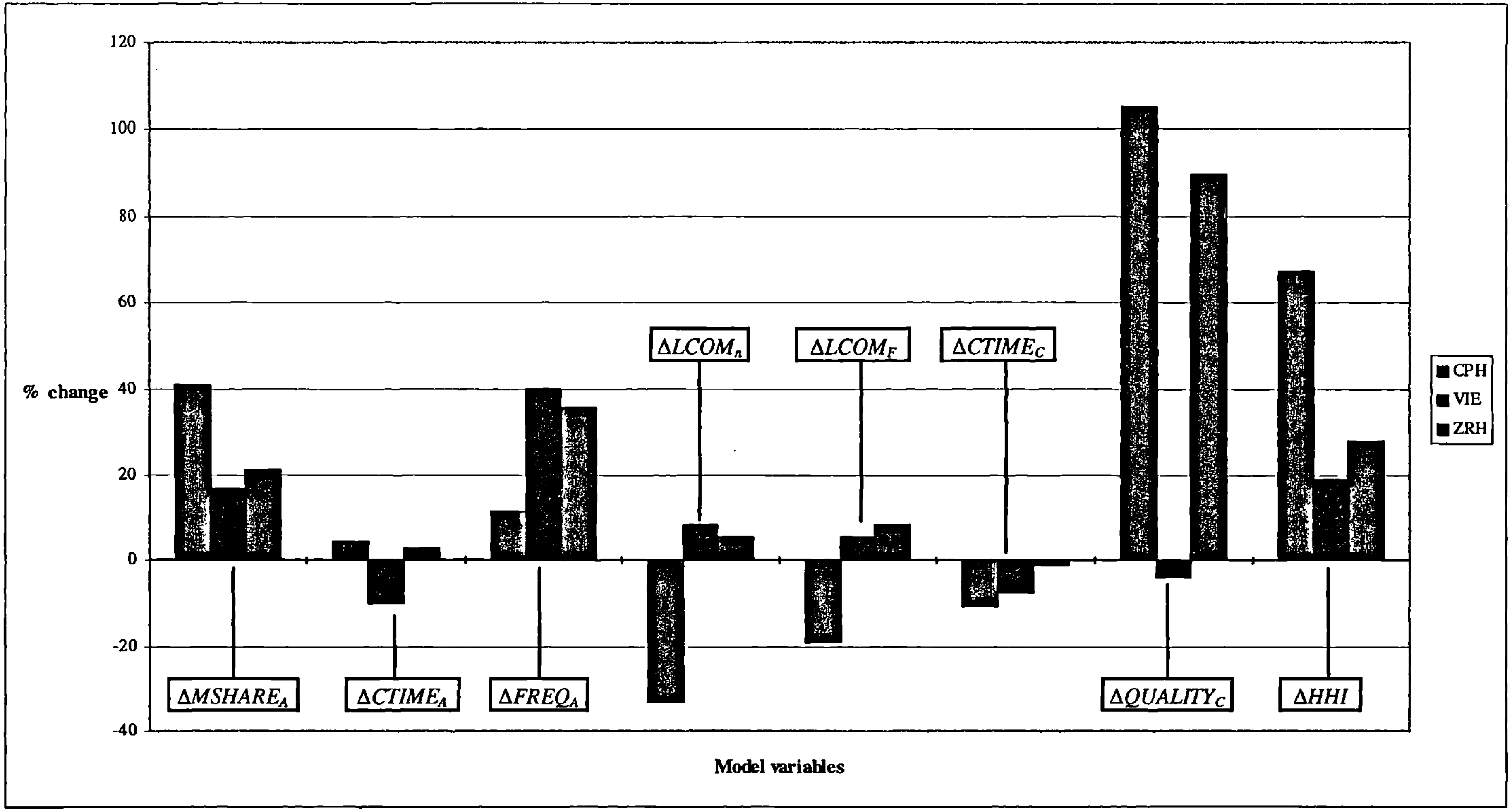


Figure 11.13 Change in model variables'means for the EQA from 1989 to 1994
MSHARE: market share; *CTIME*: connect time; *FREQ*: frequency; *LCOM*: level of competition; *QUALITY*: connection quality; *HHI*: Herfindahl-Hirschman Index of market concentration
Subscripts:
A: alliance; *n*: number; *F*: frequency-weighted; *C*: competitors

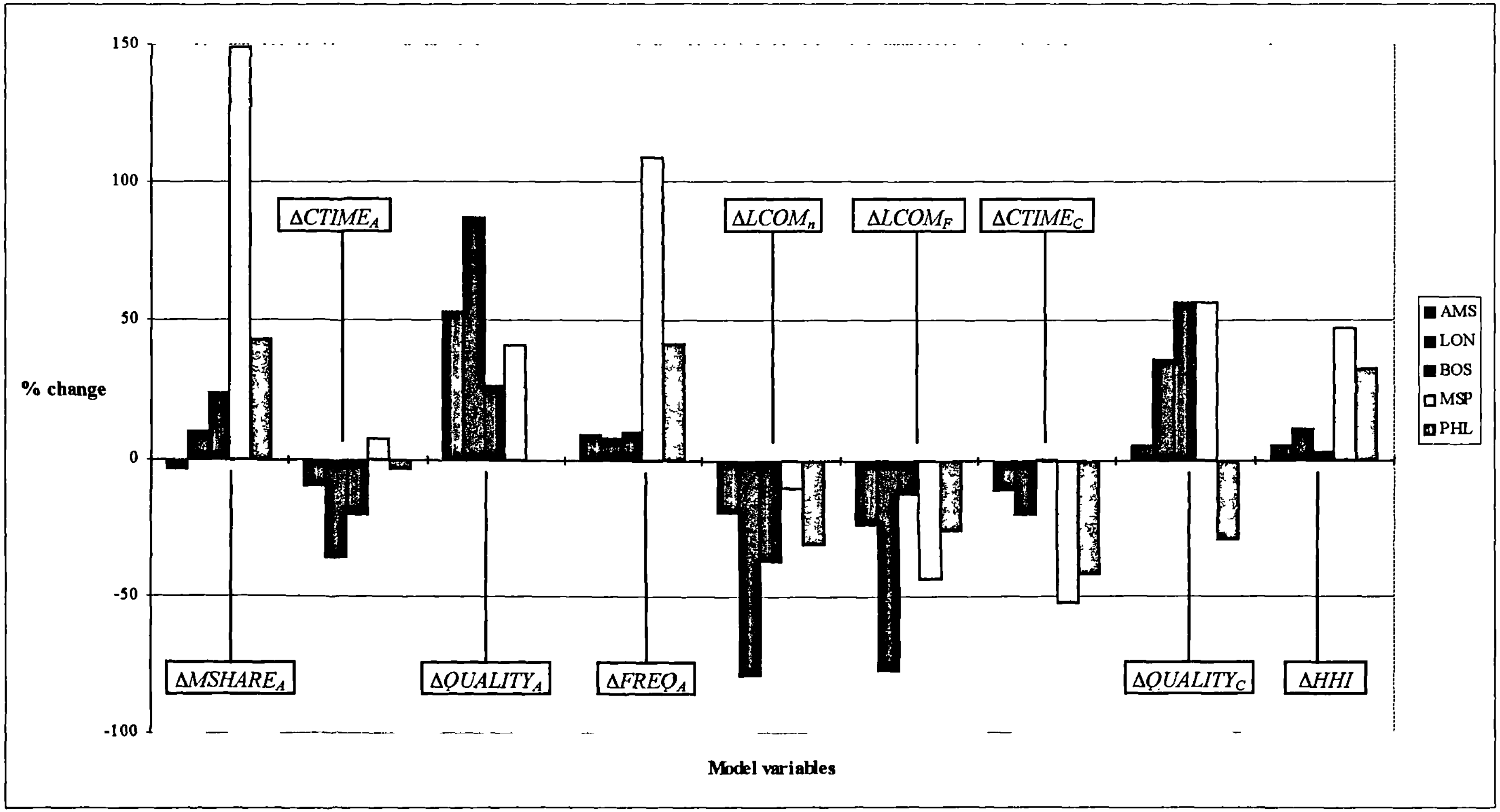


Figure 11.14 Change in model variables' means for British Airways-USAir and KLM-Northwest alliances from 1991 to 1995
See note for Figure 11.13

11.5.1 EQA

The variable $QUALITY_A$ is absent in the case of the EQA since the sample of selected O-D markets remained interline over the alliance period. Code-sharing was not implemented by the EQA in those markets so that there was no quality improvement accompanying alliance formation. However, increases in average alliance service frequency were substantial with Copenhagen, Vienna and Zurich markets experiencing an increase in average service frequency of 11.4%, 39.7% and 35.7% respectively. Only markets originating from Vienna had a decrease in average connect time and this was rather low (9.7%). Markets from Copenhagen and Zurich experienced increases in average connect time, albeit quite low (4.5% and 3.0% respectively). These observations indicate that the EQA was focused more on frequency competitiveness that on connect time improvements. The market share of the EQA increased substantially in all three cases (Copenhagen: 41.0%; Vienna: 16.6% and Zurich: 21.1%). These results seem to be linked to the frequency increases leading one to conclude that service frequency is of importance in determining market share.

In the Copenhagen O-D markets, the effect of alliance formation was to decrease the average number of competing services and their service frequency. However, the level of competition, both in terms of the number of competitors and their frequency, increased slightly in the Vienna and Zurich markets. This indicates that the market share increase of the EQA in the Vienna and Zurich markets was at the expense of the competitors, while, in the Copenhagen markets, the EQA gained market share as competitors moved out of the markets.

The increase in average service frequency is an indication of one of the strategies of the competitors to counter the effect of the alliance. Service frequency improvements were however low and occurred in only two cases, Vienna (5.4%) and Zurich (8.4%). Another strategy was to decrease connect time to render the service more attractive and to promote it to higher CRS screens. Competitor average connect time decreased in all three markets, though by small amounts (Copenhagen: 10.5%; Vienna: 7.4%

and Zurich: 1.0%). By far, the most important competitor reaction to alliance formation was to improve the quality of their services by offering more intraline and less multi-stop services. Average competitor service quality more than doubled in the markets originating from Copenhagen and by about 90% in those originating from Zurich. Competitor reaction was much less important in the Vienna markets where the competitor average service quality actually decreased by 3.7%.

Average market concentration increased in all three cases, with the highest increases occurring in the Copenhagen (67.1%) and Zurich (27.7%) markets. The trend in market concentration seems to follow that of alliance market share implying that the alliance is capable of affecting the concentration in those O-D markets in which it operates. In spite of the increase in the level of competition in the Vienna and Zurich markets, the market concentration increased. This means that a higher proportion of market share was in the hands of a lower number of competitors.

11.5.2 Transatlantic alliances

The average market share of the alliances increased for all the hubs considered, with the exception of Amsterdam where the KLM-Northwest average market share fell by 3.7%. The highest increase in average market share occurred in the case of Minneapolis with an increase of 149.1%. Second came Philadelphia where the British Airways-USAir average market share increased by 43.6%. Unlike the EQA, both transatlantic alliances made efforts to decrease average connect time. The highest decreases in average connect time occurred in the cases of Amsterdam, Boston and London (9.5%, 20.2% and 35.9% respectively). Minneapolis, however, experienced a slight increase in connect time (7.4%). Changes in alliance service quality are considered only for the KLM-Northwest alliance which practised extensive code-sharing on both sides of the Atlantic. In the case of the British Airways-USAir alliance, the sample of markets were not code-shared and hence showed no service quality improvement following alliance formation. Code-sharing increased the service quality of the KLM-Northwest alliance substantially for all three hubs, with the greatest improvement occurring for Amsterdam (53.8%). Alliance average service frequency increased in all five cases. The most important increases were those of Minneapolis and Philadelphia (109.0% and 42.0%). Increases at the other hubs considered were much lower. Like the EQA, the service frequency changes seem to be related to the changes in alliance market share.

The transatlantic alliances were very effective in decreasing the level of competition experienced in O-D markets. Indeed, both in terms of the number of competing services and their frequency, the level of competition fell for all five hubs considered. The highest decrease occurred in O-D markets originating from London (approximately 78%). The number of competitors fell by only 10% in O-D markets from Minneapolis; however, in terms of frequency, the decrease was high (43.4%). Both this decrease and the increase in alliance service frequency seem to be linked to the high increase in alliance market share.

Since it would seem that the alliance competitors were unable to compete in terms of service frequency, they instead concentrated their efforts on connect time and service quality improvements. Competitor average connect time decreased in four of the five cases, with the greatest improvements occurring for Minneapolis and London (52.7% and 41.9% respectively) which are the hubs where the alliances enjoyed their highest increases in market share. Competitor average connect time increased very slightly in the case of Boston (0.4%). This is quite surprising since Boston is used as connect point by both British airways-USAir and KLM-Northwest alliances. It could be that the competitors preferred to concentrate on service quality to counter the alliance for Boston experienced one of the highest improvements in average competitor service quality (56.6%) together with Minneapolis (57.1%). Only in the case of Philadelphia did the average competitor service quality decrease (29.3%).

Average concentration increased for all five hubs with the highest increases occurring in the cases of Minneapolis and Philadelphia (47.2% and 33.2% respectively). This seems to be linked to the changes in alliance market share and service frequency changes. Overall, these results indicate that the focus of the transatlantic alliances were in O-D markets originating from the US hubs Minneapolis and Philadelphia.

This observation coincides with the strategy of KLM and British Airways to increase their traffic feed from the US domestic market. Another observation is that though Amsterdam is the centre of KLM's operations, its alliance-related changes were among the lowest for all the five hubs considered.

11.6 Model Calibration

The conclusions drawn above are based purely on observation. In order to identify those variables contributing to the change in market share in alliance O-D markets and provide concrete numerical evidence of their effects, a mathematical model is required. Figure 11.15 shows the conceptual model of market power which is formulated at the simplest level, that is the change in alliance market share is considered to be the result of the separate effects of the alliance and competitor variables and market concentration.

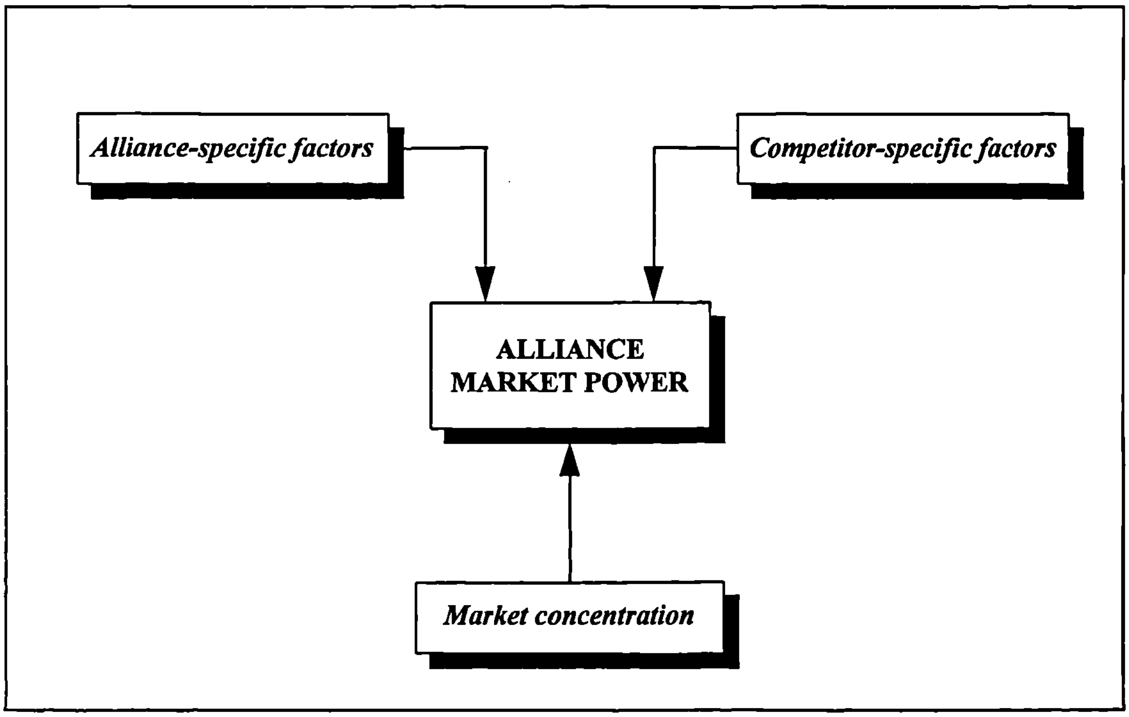


Figure 11.15 Alliance market power model

At this stage, the market concentration effects are not considered and the alliance market power model is operationalised as in Equation 11.8:

$$\Delta MSHARE_A = f(alliance,\ competitors) \qquad \textbf{(Eq. 11.8)}$$

where *alliance* is a vector of the alliance-related variables, and *competitors* is a vector of the competitor-related variables. The market share model is formulated in full in Equation 11.9.

$$\begin{aligned}\Delta MSHARE_A &= a_0 + a_1(\Delta CTIME_A) + a_2(\Delta FREQ_A) + a_3(\Delta QUALITY_A) \\ &+ a_4(\Delta LCOM_F) + a_5\left(\Delta \overline{CTIME}_C\right) + a_6\left(\Delta \overline{QUALITY}_C\right)\end{aligned} \qquad \textbf{(Eq. 11.9)}$$

The linear specification is preferred to the log-linear specification because both independent and dependent variables are changes which, if negative, can not be subjected to the logarithmic transformation. The model is calibrated using the ordinary least squares (OLS) regression technique. The dependent variable (change in alliance market share) is in percentage terms. The results of the regression are given in Table 11.6. Only those variables which are significant at the 5% level or better are presented.

Overall the models have a satisfactory explanatory power considering that the regression was of a cross-sectional type with non-homogeneous O-D markets. The only cases of low explanatory power are Vienna and Amsterdam (43.3% and 17.0% respectively). This means that variables other than those included in the model determine the change in alliance market share. The models of the transatlantic alliances have better explanatory powers than those of the EQA. All models, with the exception of Amsterdam, are valid at the 1% significance level as indicated by their *F*-statistics.

11.6.1 EQA results

The regression coefficients in the models of the EQA all have the expected signs. The only significant variables explaining the change in market share of the alliance are the changes in alliance service frequency, competitor service frequency, competitor connect time and competitor service quality.

Regression coefficient	Associated variable	O-D markets originating from: Copenhagen	Vienna	Zurich	Amsterdam	Boston	Minneapolis	London	Philadelphia
a_0	*Intercept*	–	–	0.056** (2.123)	–	0.134* (4.145)	–	–	–
a_1	$\Delta CTIME_A$	–	–	–	–	–	–	–	–
a_2	$\Delta FREQ_A$	1.40* (6.030)	–	0.92* (2.412)	1.80** (2.429)	–	2.62* (3.406)	–	–
a_3	$\Delta QUALITY_A$	–	–	–	6.91** (3.606)	3.64* (5.612)	6.21* (3.437)	–	–
a_4	$\Delta LCOM_F$	-0.19* (-2.882)	-0.59 (-6.681)	-0.60* (-5.804)	–	-0.88* (-3.110)	-0.11* (-3.345)	-0.54* (-5.305)	-0.74* (-4.127)
a_5	$\Delta \overline{CTIME}_C$	–	–	0.11* (2.345)	–	0.09* (3.429)	0.26* (10.699)	0.12* (4.118)	0.06** (2.744)
a_6	$\Delta \overline{QUALITY}_C$	-9.90* (-2.102)	-27.32 (-4.804)	–	–	-34.94* (-4.683)	-22.16** (-2.655)	-45.53* (-8.332)	-42.07* (-4.341)
Model test statistics									
n		32	75	29	27	33	24	32	38
$\overline{R}^2$		0.692	0.433	0.665	0.170	0.832	0.872	0.934	0.661
F		24.20*	29.35*	19.56*	5.90**	53.63*	40.13*	146.64*	25.00*

Table 11.6 Linear market share models of the EQA, KLM-Northwest and British Airways-USAir alliances
Dependent variable: $\Delta MSHARE_A$
*(t-statistics in parentheses; *: significant at the 1% level; **: significant at the 5% level)*

For O-D markets originating from Copenhagen, changes in alliance service frequency, the level of competition and the quality of the competition are the most important variables determining the change in market share of the alliance. According to the calibrated model, increasing the alliance weekly frequency by one would result in approximately 1.4% increase in market share[85]. Alliance market share is inelastic with respect to level of competition as were the weekly frequency of the competitors to increase by one, the alliance market share would fall only by approximately 0.2%. However, the alliance can suffer considerably from competitor service quality for an increase of one in competitor service quality (via intralining instead of interlining and less multi-stop services) can lead to a 10% decrease in alliance market share.

The change in market share of the alliance in O-D markets originating from Vienna is dependent only on the variables of competitors present in those markets, namely the competitor service frequency and quality. As in the case of Copenhagen, elasticity with respect to competitor service frequency is low with a fall of 0.6 % in alliance market share with an increase of one in competitor weekly service frequency. However, competitor service quality is quite important in determining alliance market share with a fall of 27% in market share with an increase of one in average competitor service quality.

For O-D markets originating from Zurich, the alliance market share is dependent on alliance frequency, level of competition and alliance connect time. The percentage change in alliance market share is approximately 1% for a change of one in weekly service frequency. The market share elasticity with respect to levels of competition is nearly the same as in the case of Vienna. The coefficient of competitor connect time indicates that an improvement of ten minutes could cause the alliance market share to increase by 1%.

[85] All the percentage changes cited hold provided the other variables are constant.

11.6.2 Results for transatlantic alliances

The coefficients of the regressions all have the expected signs. Only alliance variables are significant for O-D markets originating from Amsterdam. The coefficients are fairly the same for Minneapolis O-D markets. According to the calibrated models, an increase of one in alliance weekly frequency will increase its market share by approximately 2%. Also, an increase of one in service quality will increase alliance market share by approximately 6-7%. This confirms the importance of code-sharing as a competitive tool to gain market share. The coefficient of $QUALITY_A$ is lower for the Boston model with an increase of one in service quality resulting in an increase of approximately 4% in alliance market share.

Changes in alliance market share are inelastic with respect to competitor service frequency. An increase of one in competitor weekly frequency causes the alliance market share to fall by 0.9% in O-D markets originating from Boston and by only 0.1% in O-D markets originating from Minneapolis. Changes in alliance market share is also inelastic with respect to changes in competitor connect time for O-D markets originating from Boston: an improvement of ten minutes in competitor connect time causes alliance market share to decrease by only 0.9%. However, the same decrease in competitor connect time leads to a drop of 2.6% in alliance market share in markets originating from Minneapolis. Changes in alliance market share are highly elastic with respect to competitor service quality. An increase of one in competitor service quality is expected to cause a drop of 35% and 22% in KLM-Northwest market share in O-D markets originating from Boston and Minneapolis respectively.

Only competitor variables are significant in explaining the change in the British Airways-USAir market share. As for the KLM-Northwest alliance, changes in market share are fairly inelastic with respect to changes in competitor service frequency and connect time. An increase of ten in competitor service frequency leads to a decrease of approximately 0.6% in alliance market share for Philadelphia and of 1.2% for London. However, changes in competitor service quality can cause dramatic changes in alliance market share: an increase of one in competitor service quality leads to a decrease in alliance market share of about 40-50%.

11.6.3 Market concentration effects

As explained in sub-section 11.4.4, market concentration can affect alliance market power. In order to investigate the effects of market concentration changes, that variable is introduced into the regression models. The modified alliance market share model is then

$$\begin{aligned}\Delta MSHARE_A &= a_0 + a_1(\Delta CTIME_A) + a_2(\Delta FREQ_A) + a_3(\Delta QUALITY_A) \\ &+ a_4(\Delta LCOM_F) + a_5\left(\Delta \overline{CTIME}_C\right) + a_6\left(\Delta \overline{QUALITY}_C\right) + a_7(\Delta HHI)\end{aligned} \qquad \textbf{(Eq. 11.10)}$$

The results of the OLS regression are given in Table 11.7 . Again, only those variables which are significant at the 5% level or better are presented.

Introduction of the market concentration variable improves the explanatory power of all the models with the exception of Zurich. The model F-statistics also increase and are all significant at the 1% level. The market concentration variable is significant at the 1% level in all the models with its coefficient being fairly close to unity except in the cases of Zurich and Boston. The high level of significance of the market concentration shows that alliance market share changes are heavily dependent on this variable. Inclusion of the market concentration variable into the market share models causes a number of variables to turn non-significant meaning that it absorbs their effects on the alliance market share variable. This observation tends to indicate that market concentration is an intervening variable between the alliance and competitor variables and alliance market share, that is changes in service frequency, connect time and quality of service affect market concentration which, in turn, affects alliance market share.

In order to investigate this hypothesis, change in O-D market concentration is regressed against the alliance and competitor variables. The results of the OLS regression are presented in Table 11.8. With the exception of Zurich, the model explanatory powers are reasonably high and they have highly significant F-statistics.

Regression coefficient	Associated variable	O-D markets originating from: Copenhagen	Vienna	Zurich	Amsterdam	Boston	Minneapolis	London	Philadelphia
a_0	*Intercept*	–	–	0.063** (2.123)	–	–	–	–	–
a_1	$\Delta CTIME_A$	–	–		–	–	-0.03 (-2.193)	–	–
a_2	$\Delta FREQ_A$	1.26* (4.185)	0.41* (3.237)	–	–	4.86* (3.467)	1.54 (2.320)	–	1.46 (3.460)
a_3	$\Delta QUALITY_A$	–	–	–	–	–	–	–	–
a_4	$\Delta LCOM_F$	–	–	-0.47* (-4.036)	–	-0.63* (-2.571)	–	-0.22 (-4.026)	–
a_5	$\Delta \overline{CTIME}_C$	–	–	–	–	0.08 (3.580)	0.12 (6.763)	0.03 (2.832)	0.07 (3.178)
a_6	$\Delta \overline{QUALITY}_C$	–	–	–	–	-18.80 (-2.713)	–	–	–
a_7	ΔHHI	0.85* (8.449)	1.06* (25.125)	0.27* (2.882)	1.34 (2.752)	0.36* (3.747)	0.64* (4.819)	1.006* (22.195)	0.618* (7.710)
Model test statistics									
n		32	75	29	27	33	24	32	38
$\overline{R}^2$		0.740	0.895	0.665	0.215	0.895	0.936	0.988	0.814
F		46.45*	316.89*	28.87*	7.57*	55.79*	54.48*	824.27*	55.07*

Table 11.7 Modified linear market share models of the EQA, KLM-Northwest and British Airways-USAir alliances

Dependent variable: $\Delta MSHARE_A$

*(t-statistics in parentheses; *: significant at the 1% level; **: significant at the 5% level)*

Regression coefficient	Associated variable	O-D markets originating from: Copenhagen	Vienna	Zurich	Amsterdam	Boston	Minneapolis	London	Philadelphia
a_0	*Intercept*	–	3.143* (2.957)	0.132** (2.987)	–	0.089** (2.268)	–	–	–
a_1	$\Delta CTIME_A$	–	–	–	–	–	–	–	–
a_2	$\Delta FREQ_A$	–	–	–	0.90 (4.232)	–	1.32** (1.872)	–	–
a_3	$\Delta QUALITY_A$	–	–	–	–	–	–	–	–
a_4	$\Delta LCOM_F$	-0.28 (-2.763)	-0.57 (-7.435)	-0.72 (-3.723)	–	–	-1.44** (-5.361)	-0.75* (-7.847)	-0.74* (-4.127)
a_5	$\Delta\overline{CTIME}_C$	0.17 (4.015)	–	–	–	0.15* (5.154)	0.11* (5.290)	0.10* (3.400)	0.06** (2.744)
a_6	$\Delta\overline{QUALITY}_C$	–	-24.05 (-4.896)	–	-8.93 (2.148)	–	-23.71* (-3.159)	-44.74* (-8.160)	-42.06* (-4.341)
Model test statistics									
n		32	75	29	27	33	24	32	38
$\bar{R}^2$		0.424	0.475	0.315	0.531	0.444	0.749	0.939	0.589
F		12.75*	34.49*	13.86*	14.59*	26.56*	18.22*	160.68*	18.69*

Table 11.8 Modified linear market share models of the EQA, KLM-Northwest and British Airways-USAir alliances

Dependent variable: ΔHHI

*(t-statistics in parentheses; *: significant at the 1% level; **: significant at the 5% level)*

Competitor variables are of value in explaining changes in market concentration in most of the models. Alliance variables (frequency) are present only in the cases of Amsterdam, Minneapolis and Philadelphia. The fact that the alliance and competitor variables explain the variation in market concentration changes to a certain extent reinforces the belief that market concentration is in effect an intermediate variable.

11.6.4 General conclusions

Taken together, the results of the modelling exercise indicate that service frequency and service quality are important alliance attributes which determine the market share it can gain. Surprisingly, the change in alliance market share is found to be independent of alliance connect time improvement. In general, the competitor variables dominated over the alliance variables. For Vienna, London and Philadelphia, they are the only variables present in the models. The level of competition and competitor connection quality are significant variables in the case of the EQA. For transatlantic alliances, the competitor connect time improvement is also of value in explaining the performance of the alliances. Graphical analysis of the variable changes shows that competitors are very likely to react to alliance formation by providing more on-line connections and by discarding the multi-stop services so as to improve the overall quality of their services. The reaction of the competitors is to be expected as the market share gain of the alliance comes partly at their expense.

The market share models are complicated by the complex involvement of market concentration in the market share models. Indeed, in addition to direct effects, there are strong indications that the alliance and its competitors also affect alliance market share changes indirectly via changes in market concentration. This is apparent in the regression with market concentration as dependent variable instead of market share. Hence, one can conclude that the market power model of alliances is not as simple as to be suitably approximated by the linear regression model.

One means by which to obtain alliance variable coefficients while, at the same time, taking competitor reactions into account is to run a logit model. The theory behind the application of that particular model is considered next.

11.7 The Logit Model

The logit modelling technique is appropriate in this situation as it can take into account the simultaneity that exists between the alliance-induced changes and the competitor reactions to those changes. Indeed, the specification of the logit model is such that a change in the alliance attributes will affect its market share only if it is not accompanied by a proportional change on the part of its competitors. The theoretical background of the logit model is briefly presented below.

11.7.1 Theory of the logit model

This logit modelling technique views the traveller as a rational decision-maker who evaluates the different travelling options according to certain criteria and chooses the option which has the highest overall attractiveness (utility) based on those criteria. Due to inconsistencies in choice behaviour and observational deficiencies, the total utility of each alternative is considered as the sum of two parts, (1) the representative component (V) and (2) the random component (ε). The general form of the logit model expresses the probability of selecting carrier i (P_i) instead of carrier j as a function of the representative components of the utilities of i and j[86]:

$$P_i = \frac{\exp(V_i)}{\exp(V_i) + \exp(V_j)} \qquad \textbf{(Eq. 11.11)}$$

The market share is effectively an estimate of the probability of selection. Using logarithmic transformations and mathematical manipulations, Equation 11.11 can be re-written as

$$Ln\left(\frac{MS_i}{MS_j}\right) = V_i - V_j \qquad \textbf{(Eq. 11.12)}$$

The logit model has been used in a number of air transport studies to model either airport, airline or mode of travel choice. For a comprehensive compilation and

[86] This expression is based on the assumptions that ε is independent, identical across the alternatives and logistically distributed.

analysis of the results of such studies, the reader is referred to Alamdari and Black (1992).

11.7.2 Application to the alliance context

In the context of this study, the traveller going from H_x to D is required to choose between flying with the alliance or with its competitors. The logit model will therefore be calibrated for the period of June 1994 when the EQA, British Airways-USAir and KLM-Northwest alliances were already created and operational. The choice of the traveller is considered to depend on the variables identified previously, that is frequency of service, connect time and quality of service. As before, the competitors will be aggregated and considered as one choice.

In the previous analysis which was based on variable changes, the aircraft type was not considered since it did not vary greatly as a result of alliance formation. Since this analysis is for the post-alliance period only, the aircraft type has to be controlled for as passengers prefer to travel with large aircraft rather than with narrow-bodied aircraft. The values applied in the Boeing *QSI* model will be used in quantifying the attractiveness of the various aircraft types. These values can be found in Appendix H. Since O-D markets consisting of at least two flight segments are the subject of analysis, the aircraft type values for the H_x–H_y and H_y–D portions of the flight are added to give an overall measure of aircraft type for the service.

Depending on the type of traveller, fares can be important in the choice of service and it has been shown to have a significant in the utility function by Alamdari (1989), Carlton *et al* (1980) and Kanafani and Ghobrial (1985) among others. However, fare data especially in connecting markets is not available for all the markets included in the study. Consequently, there is no choice but to exclude the fare variable from the logit model and to sacrifice some of the model explanatory power by doing so.

The representative utility (V_A) of the alliance service is given by

$$V_A = b_1(FREQ_A) + b_2(CTIME_A) + b_3(QUALITY_A) + b_4(ACTYPE) \qquad \textbf{(Eq. 11.13)}$$

where $ACTYPE$ is the aircraft type and $b_0 \ldots b_4$ are variable coefficients. Likewise, the competitors' representative utility is

$$V_C = b_1\left(FREQ_C\right) + b_2\left(\overline{CTIME}_C\right) + b_3\left(\overline{QUALITY}_C\right) + b_4\left(\overline{ACTYPE}_C\right) \qquad \textbf{(Eq. 11.14)}$$

where $\overline{ACTYPE}_C$ is the frequency-weighted average aircraft type of the competitors.

From Equation 11.12, the probability of selecting the service provided by the alliance carriers is

$$Ln\left(\frac{MS_A}{MS_C}\right) = b_0 + b_1\left(FREQ_A - FREQ_C\right) + b_2\left(CTIME_A - \overline{CTIME}_C\right)$$
$$+ b_3\left(QUALITY_A - \overline{QUALITY}_C\right) + b_4\left(ACTYPE_A - \overline{ACTYPE}_C\right) \qquad \textbf{(Eq. 11.15)}$$

OLS regression can be used on Equation 11.15 to obtain the values of the coefficients. Substitution of these coefficients into the alliance utility function can then allow an analysis of the determinants of alliance attractiveness, and hence market share.

11.7.3 Model results and discussion

The results of the regression for the EQA, KLM-Northwest and British Airways-USAir alliances are given in Table 11.9. Except for Minneapolis, London and Philadelphia, the explanatory power of the models is low ranging from 43% (Copenhagen) to 56% (Boston). A possible explanation for the low explanatory power of the models could be the exclusion of fares from the modelling process. Indeed, economies on the cost side resulting from alliance formation could have been passed on to the consumer in the form of lower fares. Having fares which are lower than those of its competitors increases the attractiveness of the alliance service and therefore increases its market share. Unfortunately, the lack of fare data does not allow this hypothesis to be tested. Nevertheless, the models are valid with *F*-statistics which are significant to the 1% level.

The logit models seem to be very effective in disentangling the alliance effects from those of the competitors.

Regression coefficient	Associated variable	O-D flights originating from: Copenhagen	Vienna	Zurich	Amsterdam	Boston	Minneapolis	London	Philadelphia
b_0	*Intercept*	-1.590* (-6.798)	–	–	-1.035* (-4.796)	-0.562* (-2.860)	–	–	–
b_1	*FREQ*	0.013* (2.391)	0.011* (2.241)	0.015* (3.544)	0.021* (4.556)	0.035* (5.825)	0.056* (6.988)	0.034* (5.648)	0.039* (8.696)
b_2	*CTIME*	-0.037* (-3.252)	-0.036* (-5.492)	-0.005* (-2.889)	-0.150* (-2.019)	-0.093* (-4.694)	-0.091* (-6.657)	-0.037* (-2.510)	-0.015* (-3.148)
b_3	*QUALITY*	1.604* (3.054)	0.792* (2.663)	0.110* (2.647)	0.667* (2.242)	0.034* (3.591)	0.034* (2.657)	0.086* (2.809)	0.123* (2.205)
b_4	*ACTYPE*	–	–	–	–	–	0.236** (1.857)	–	–
Model test statistics									
n		32	75	29	27	33	24	32	38
$\overline{R}^2$		0.433	0.553	0.579	0.570	0.559	0.795	0.873	0.757
F		12.84*	18.97*	16.83*	16.25*	33.93*	28.11*	134.37*	75.62*

Table 11.9 Logit market share models of the EQA, KLM-Northwest and British Airways-USAir alliances
*(t-statistics in parentheses; *: significant at the 1% level; **: significant at the 5% level)*

The striking feature of the statistical results is that for all origins, the alliance frequency quality of service, and connect time have a significant presence in the alliance utility function. This indicates that these attributes are highly valued by travellers in their choice of service, and therefore determine to a certain extent the alliance market share. The high coefficients of *QUALITY* relative to those of the other variables suggest that travellers attach greater importance to the quality of service; that is, they prefer intraline services to interline ones. This is indicative of the importance of code-sharing between carriers in alliances because the method of measurement placed a greater weighting on code-shared connections than those which were not. However, one has to bear in mind that the advantages conferred by code-sharing could decrease with time as consumer groups pressure for clearer identification of code-shared connections at the time of ticket purchase.

The coefficients of service frequency have the same magnitude throughout the sample of hubs. Coefficient means are 0.013 for the EQA, 0.037 for British Airways-USAir and 0.112 for KLM-Northwest. The interpretation of these figures is that an increase of ten in alliance weekly frequency will increase the attractiveness of the EQA service by approximately 0.1 units, of the British Airways-USAir service by approximately 0.4 units and of the KLM-Northwest service by approximately 1.1 units, everything else remaining unchanged. The lower mean coefficient of the EQA could be explained by the strong intermodal competition existing between air and rail transportation in Europe. Owing to the highly-developed rail network in Europe, travellers are less sensitive to frequency changes. This is an important factor to be considered when forming alliances within Europe.

Aircraft type is included in the model to control for its effects on market share. However, it does not seem to affect the choice of service. The *ACTYPE* variable is present only in the Minneapolis utility function and even then, it is marginally significant. According to the model, improving the average aircraft type by one increases the alliance attractiveness by 0.2 units. One possible explanation for that could be the fact that the carriers competing in the O-D markets use roughly the same type of aircraft.

The coefficient of connect time has the expected negative coefficient in all of the models except for Zurich. The reason for the 'wrong' sign in the case of Zurich was traced to a high correlation (r = 0.85) between the connect time and service frequency variables[87]. The coefficients have a mean of -0.026 for the EQA and a mean of -0.077 for the transatlantic alliances. An improvement of ten minutes in connect time can therefore result in an increase of approximately 2.6 units in the utility of the EQA service, and an increase of approximately 7.7 units in the utility of the transatlantic service, all other variables being constant. The difference in elasticity between the European and transatlantic alliances is to be expected because the distances involved are different. O-D distance, and hence travel time, is shorter in the case of the EQA because the inter-hub distance is shorter. Therefore, a reduction in connect time achieved by the long-distance transatlantic alliances is more likely to be appreciated by travellers than the same connect time reduction achieved by the European alliance.

The intercept term in the utility function can be interpreted as the attractiveness of the alliance keeping frequency, connect time, service quality and aircraft type constant. In nearly all cases, the hypothesis that the intercept term is not zero can not be rejected. Furthermore, where significant, it is negative. The fundamental conclusion that can be drawn from these results is that the belief that alliance formation in and by itself is sufficient to increase airline market share is false. Indeed, in many cases, airlines have rushed to form alliances, only to cease co-operation after the agreement-signing stage. Just being an alliance on paper brings no benefits; this study has shown that co-operation is necessary to increase service frequency, decrease connect time and implement code-sharing for the alliance to yield the expected market share increase.

11.8 Conclusion

This chapter has attempted to identify the factors which affect the increase in market power achievable via the alliance strategy. Because of data limitations, only market share approximated by frequency share was used as measure of market power. An

[87] The quoted frequency coefficient is that obtained when the regression is performed without the inclusion of the connect time variable.

analysis of the inter-hub and O-D markets has shown that the EQA, British Airways-USAir and KLM-Northwest alliances have experienced increases in market share in most cases. Mathematical modelling was performed using both OLS and logit techniques. Variable analysis and OLS regression revealed that alliance formation is accompanied by a rapid reaction by competitors, the reaction being mainly focused on providing more intraline/code-shared services and less interline and multi-stop services. The linear model also revealed the importance of alliance O-D service frequency and the quality of the connection as important success variables. However, the linear model revealed that the structure of the relationship between alliance-related factors, competitor-related factors and market concentration was quite complex. Interpretation of the linear model was also hampered by the fact that the competitor variables dominated over the alliance variables. From that, it was deemed necessary to calibrate a logit model which would enable determination of the alliance variables. The logit models confirmed the importance of alliance service frequency and connection quality in the performance of the alliance. In addition, it revealed that alliance connect time is also critical to alliance success.

12. PRODUCTION BENEFITS OF AIRLINE ALLIANCES

Introduction

The aim of this chapter is to analyse the effects of alliance formation on airline costs and productivity, and to identify those areas where alliances provide the greatest potential for cost reduction and productivity increases. The EQA is the alliance on which the analyses are based, with Austrian Airlines being the airline of focus.

Analysis of the production benefits of alliances carries the same problem as in the case of the marketing benefits, namely the separability of effects. Indeed, great methodological difficulties were experienced when trying to isolate the effects of the alliance from other factors which affect airline productivity and unit costs. Therefore, this analysis limits itself to the graphical demonstration of the overall effects and, from that, judgementally assess whether the alliance has been effective.

The chapter starts by identifying the airlines which will be subjected to the analysis and then proceeds with a description of how the alliance effects will be demonstrated. Aggregate unit costs and labour productivity are then analysed. The analysis then proceeds at a disaggregate level with a classification of the airline cost and productivity items being devised. Measures of unit cost and productivity for those items are then defined and applied to Austrian Airlines and Finnair. The final part of the chapter draws conclusions from the results.

12.1 Cost And Productivity Items

Production benefits of alliances are achieved either by the sharing of costs between the partners or by the elimination of the cost item as it is taken over by the partner. The strategies for cost reduction were detailed in Chapter 6; they are summarised in Table 12.1.

Cost category	Cost-reduction strategy
Facilities	Joint or reciprocal use of maintenance bases and equipment, airport infrastructure, (terminal facilities, business lounges, check-in desks) and sales offices leading to improved utilisation and cost avoidance
Labour	Reduction in the number of employees and improved utilisation/productivity of labour force for sales, maintenance, airline and airport operations
Capacity	Capacity reduction and/or improved utilisation of aircraft
Purchasing	Increased power to negotiate discounts in the purchase of aircraft, aircraft parts, fuel, insurance and administrative equipment
Other	Joint training of personnel, exchange of equipment to avoid renting from external suppliers, administrative costs

Table 12.1 Areas of cost reduction via alliances

Essentially, the successful implementation of these strategies is expected to show up as *lower unit costs*, *increased labour productivity* and *increased asset utilisation.* One way to verify whether alliance formation has had any effect on unit costs, productivity and utilisation is to monitor these quantities over a time period starting before alliance formation and ending after alliance formation.

12.2 Airline And Alliance Selection

In the examination of costs, the unit of analysis is the airline. The selected airline is Austrian Airlines (OS) which has formed part of the EQA ever since its inception in

1989. This particular alliance is chosen because it is more advanced in the implementation of strategies for cost reduction, and also because it has been in existence long enough for its effects to be observable. In addition, the cost-reduction strategies have been applied over a large part of the airlines' networks so that the effects are more liable to show up when their overall costs are analysed. This is in contrast to the KLM-Northwest and British Airways-USAir alliances where the practice of cost reduction is very localised (transatlantic operations only) and therefore, not easily detected in an analysis of overall costs. Cost and productivity data specific to transatlantic operations only are not available making the analysis of those alliances impossible.

Changes in unit costs, productivity and utilisation are monitored over the period 1985-1994. That particular time span is selected because the EQA came to existence in 1989 and therefore, the pre-alliance period (1985-1989) and the post-alliance period (1989-1994) are approximately of the same lengths, providing a good basis for comparison. Furthermore, 1994 is the latest year for which data is available.

Swissair and SAS are not included in the analysis because over the period selected, they were very active in alliances other than the EQA. Indeed, Swissair is still involved in the Global Excellence while SAS was co-operating with numerous other airlines such as Continental Airlines, Canadian Airlines and Thai Airways (see Figure 4.16). Therefore, any observed changes in its unit costs and productivity of SAS and Swissair could not be amenable solely to the EQA. Austrian Airlines, on the other hand, was involved extensively only in the EQA from 1989 to 1994 so that changes in unit cost and productivity can be traced back to that alliance only.

12.3 Detection Of Alliance Effects

In order to investigate whether the EQA has had any substantial effect on Austrian Airlines, it is necessary to compare its results with those of a similar airline that was not involved in any major strategic alliance over the period 1985-1994. That airline is chosen to be Finnair. The latter was involved in the EQA in 1989, but opted out of it shortly after the alliance was formed so that it is highly improbable that the EQA had any significant effect on its operations. Austrian Airlines and Finnair are similar in that they are both short/medium haul airlines[87] and are both based in Europe. Therefore, they are expected to have similar cost structures. The selection of Finnair was also driven by the fact that it was the only airline to have consistently reported its cost and performance data in the *ICAO-Digest of Statistics* and *IATA WATS*.

The important quantity to be considered in the comparison of Austrian and Finnair is the rate of change of unit cost/productivity over the post-alliance period (1989-1994). A greater rate of decrease/increase of unit cost/productivity for Austrian Airlines over the post-alliance period would lend support to the hypothesis that the effects were caused by the EQA. However, it is also important to compare rates of change for Austrian Airlines in the pre- and post-alliance periods as it is possible that the EQA effects, though present, are not sufficient to improve Austrian's costs and productivity beyond those of Finnair.

Costs are expressed in US dollars brought down to 1990 terms using Consumer Price Indices (CPI) to eliminate the effect of inflation. This conversion of cost data is deemed important as inflation is beyond the control of airlines. It is recognised that the conversion to US dollars exposes monetary quantities to the problem of fluctuating exchange rates. However, this is unavoidable as costs of two airlines based in different European countries are being compared. In order to relate the unit costs and productivity of the two airlines and to make them more comparable, unit costs and productivity are expressed in terms of an index with 1989 values being equivalent to 100. The year 1989 is selected as the base year because interest lies in what happens to unit costs and productivity after that year. The following sections provide a graphical comparison of Austrian Airlines and Finnair. First, the aggregate unit cost and labour productivity will be analysed. Unit cost and labour productivity analysis at the disaggregate level will then follow. Raw data from which the figures are derived is given in Appendix I.

[87] In 1989, Austrian's average stage length was 698 km and Finnair's average stage length was 929 km. Finnair does however have a long-haul network.

12.4 Aggregate Unit Cost and Labour Productivity Comparison

The trends in unit operating cost, labour unit cost and labour productivity of the airlines over the period 1985-1994 are depicted in Figure 12.1, Figure 12.2, and Figure 12.3 respectively.

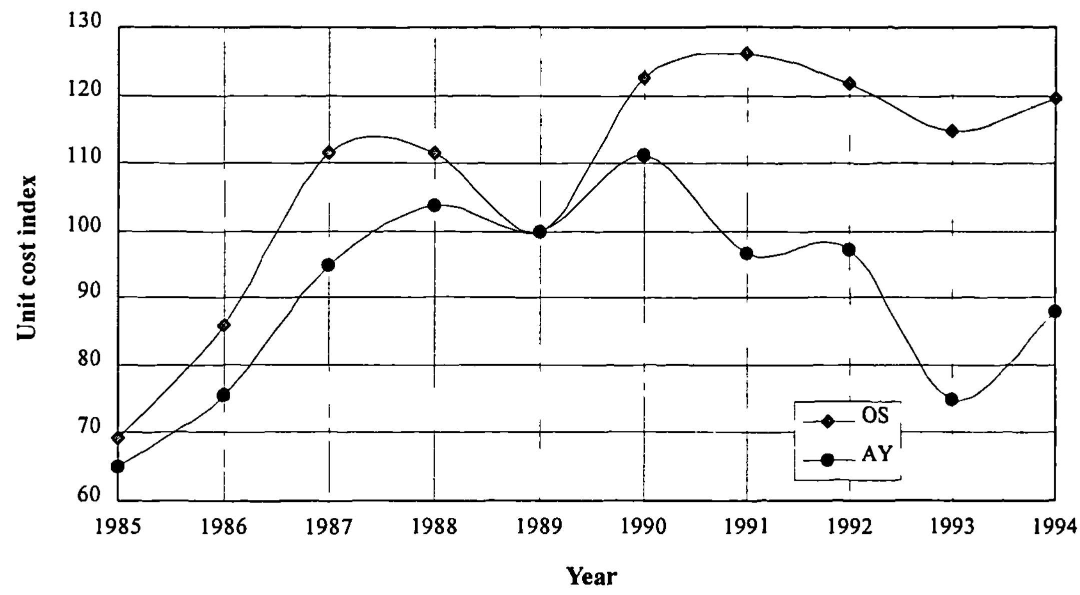


Figure 12.1 Unit operating cost

Unit operating cost is obtained by dividing the total operating cost of the airline by its output (ATK). One would expect the unit operating cost of Austrian to decrease at a faster rate than that of Finnair in the post-alliance period as a result of co-operation within the EQA. However, this does not seem to be the case. Both Austrian's and Finnair's unit operating cost increase in the year following alliance formation with Austrian's rate of change being higher than that of Finnair. After 1990, the unit operating cost of the two airlines follow a generally decreasing trend. The rate of decrease of Austrian is lower than that of Finnair. This could imply that alliance formation did not have an appreciable effect on the unit operating cost of Austrian Airlines.

Unit labour costs shown in Figure 12.2 are measured as the ratio of total labour costs to output.

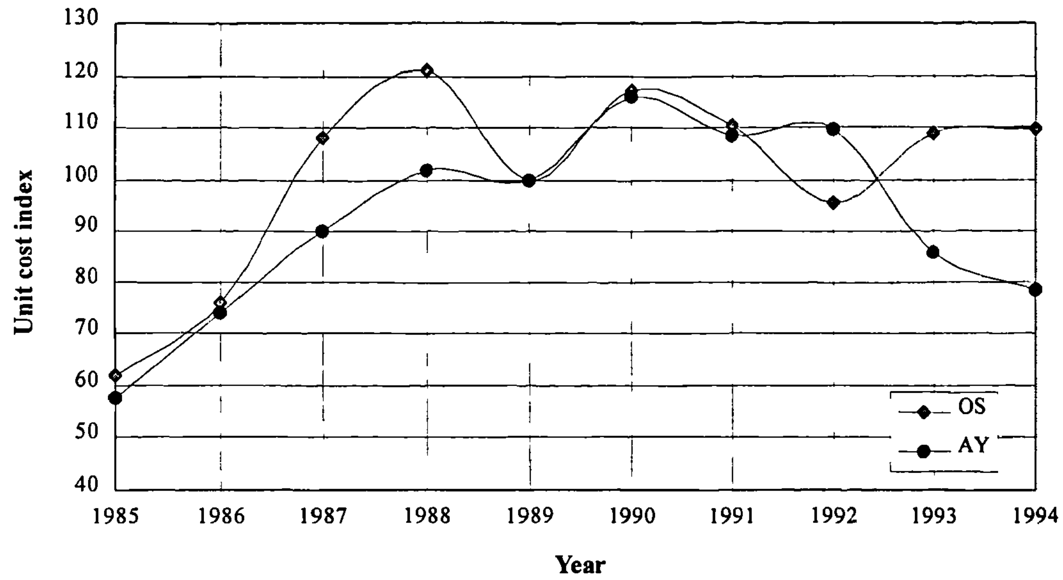


Figure 12.2 Unit labour cost

It is known that collaboration within the EQA has focused on exchanging and cross-utilising personnel. Therefore, the rate of decrease of Austrian's unit labour cost should exceed that of Finnair after 1989. However, from 1989 to 1991, Austrian's and Finnair unit labour costs follow exactly the same paths, increasing in 1990 and decreasing in 1991. Austrian labour unit cost does continue to fall after 1991; however, as from 1992, it increases while Finnair's unit labour cost decreases. Therefore, it appears that the effect of the alliance on unit labour costs is virtually inexistent.

Labour productivity measured as the ATK per employee is shown in Figure 12.3. Again, as a result of cross-utilisation of personnel, one would expect the rate of increase of Austrian's labour productivity to exceed that of Finnair in the post-alliance period. In the first year following alliance formation, this seems to be the case. This is also apparent in the period 1991-1992 when Austrian experienced a sharp increase in labour productivity while Finnair's labour productivity decreased. However, after 1992, Austrian's labour productivity flattened out while that of Finnair increased sharply. From the comparison, it would appear that alliance formation had a positive effect on Austrian's labour unit cost.

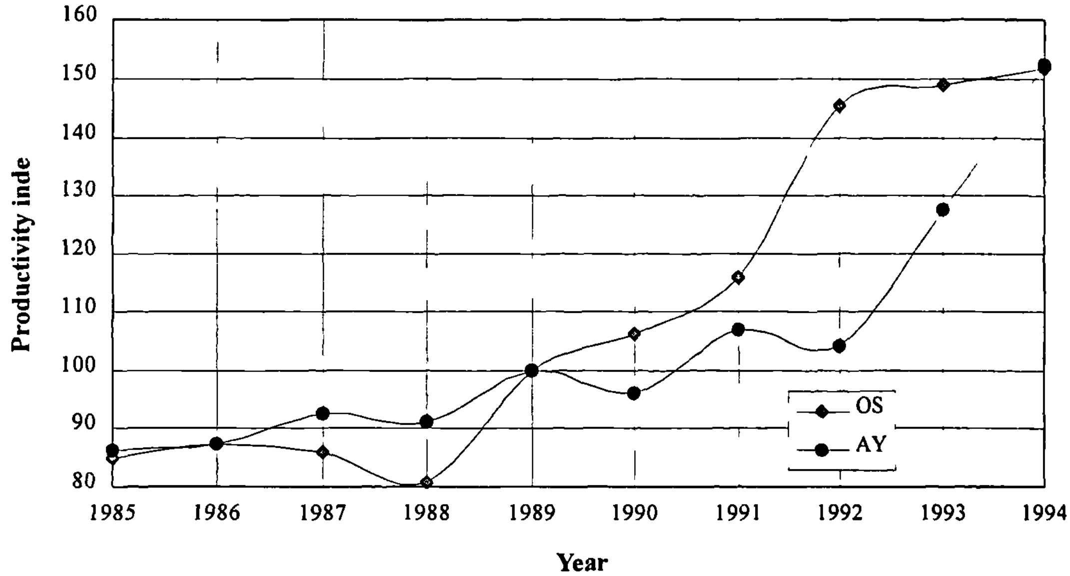


Figure 12.3 Labour productivity

The graphical analysis indicates that alliance formation did not have much of an effect on the unit operating cost and labour cost of Austrian Airlines. The effect on labour productivity is also not very clear. One possible reason for that could be the way in which these quantities were measured. Indeed, the use of ATK as unit of production is not appropriate for all the labour groups within the airlines. For example, a more appropriate unit of production for flight crew is flying hours. Likewise, cabin crew produce revenue passenger kilometres (RPK). Another reason for the lack of alliance effect is that collaboration has extended only to specific cost areas of Austrian Airlines. Therefore, an analysis of the overall unit costs is likely to conceal any alliance effects. In the next section, areas of co-operation will be identified and appropriate measures defined for unit cost and productivity.

12.5 Areas Of Collaboration

The various areas of collaboration in the EQA are identified in Table 12.2.

Cost category	Sub-category	Unit cost measure	Productivity measure
Labour	Flight crew	$\frac{\textit{Flight personnel costs}}{\textit{Flying hours}}$	$\frac{\textit{Flying hours}}{\textit{Flight personnel numbe}}$
	Cabin crew	$\frac{\textit{Cabin personnel costs}}{\textit{RPK}}$	$\frac{\textit{RPK}}{\textit{Cabin personnel number}}$
	Maintenance and overhaul (M&O)	$\frac{\textit{M\&O personnel costs}}{\textit{Flying hours}}$	$\frac{\textit{Flying hours}}{\textit{M\&O personnel number}}$
	Ticketing, sales and promotion (TSP)	$\frac{\textit{TSP personnel costs}}{\textit{Passenger number}}$	$\frac{\textit{Passenger number}}{\textit{TSP personnel number}}$
	Other	$\frac{\textit{Other personnel costs}}{\textit{ATK}}$	$\frac{\textit{ATK}}{\textit{Other personnel number}}$
Facilities	Station	$\frac{\textit{Station costs}}{\textit{Aircraft departures}}$	-
	M&O*	$\frac{\textit{M\&O costs}}{\textit{Flying hours}}$	-
	TSP*	$\frac{\textit{TSP costs}}{\textit{Passenger number}}$	-
Capacity	Aircraft	-	$\frac{\textit{Flying hours}}{\textit{Number of aircraft}}$
Purchasing	Fuel and oil	$\frac{\textit{Fuel and oil costs}}{\textit{ATK}}$	-
	Insurance	$\frac{\textit{Insurance costs}}{\textit{ATK}}$	-
Other	Rental	$\frac{\textit{Rental costs}}{\textit{ATK}}$	-
	Training	$\frac{\textit{Training costs}}{\textit{Number of employees}}$	-
	Administration	$\frac{\textit{Administration costs}}{\textit{ATK}}$	-

Table 12.2 Unit cost and productivity measures
*: Minus labour costs

It is important to be clear as to what each cost category actually encompasses. Since data for the computation of unit costs and productivity are taken from the *ICAO Digest of Statistics* and *IATA-WATS*, their definition of each category is adopted. Flight crew and cabin crew costs include pay and allowances, pensions, insurance, travelling and crew equipment costs. Maintenance and overhaul (M&O) personnel costs, and ticketing, sales and promotion (TSP) personnel costs consist essentially of the pay and allowances of the personnel involved in those activities. 'Other' personnel are those who can not be classified in either of the above-mentioned categories. Usually, they consist of general and administrative personnel.

Station costs includes items such as the pay, allowances and expenses of all station staff engaged in handling and servicing aircraft and load, station accommodation costs, maintenance and insurance of airport facilities, representation and traffic handling fees charged by third parties for handling the air services of the airline, station store charges, rental of stores and storekeepers' pay and allowances. M&O costs include the cost of maintenance for keeping aircraft, engines and spares in operative conditions, the cost of repair and overhaul and certificate of airworthiness overhaul carried out under government mandatory requirements. This cost item also includes the cost of repair, overhaul and maintenance of the flight equipment by outside contractors and manufacturers. TSP costs involve accommodation costs (rental of sales offices), commissions on ticket sales, agency fees for outside services, and the costs of advertising and publicity through various media.

Fuel and oil costs include purchasing expenses, non-refundable duties and taxes involved with those items. Insurance costs include insurance against accidental damage to flight equipment while in flight and on the ground and insurance against liability occurring from operation of aircraft. Rental costs include expenses arising from the rental of aircraft and crews from other carriers.

Training costs includes the costs of training flight crew. Administrative costs include expenses incurred in performing general and administrative functions of the airline and those expenses relating to matters of a general corporate nature.

As mentioned previously, sources of data for the computation of unit costs and productivity are the *ICAO-Digest of Statistics*, *Financial Data* and *Fleet and Personnel*, and the *IATA-WATS*. However, a disadvantage inherent in these data sources is the overlap between the labour and facilities categories with labour costs included in the latter. Therefore, an approximation to the costs of running the facilities was obtained by subtracting the labour costs from the total facilities costs. However, in the case of station expenses, this was not possible since labour cost data for that category was not available.

12.6 Disaggregate Unit Cost And Productivity Comparison

12.6.1 Labour cost

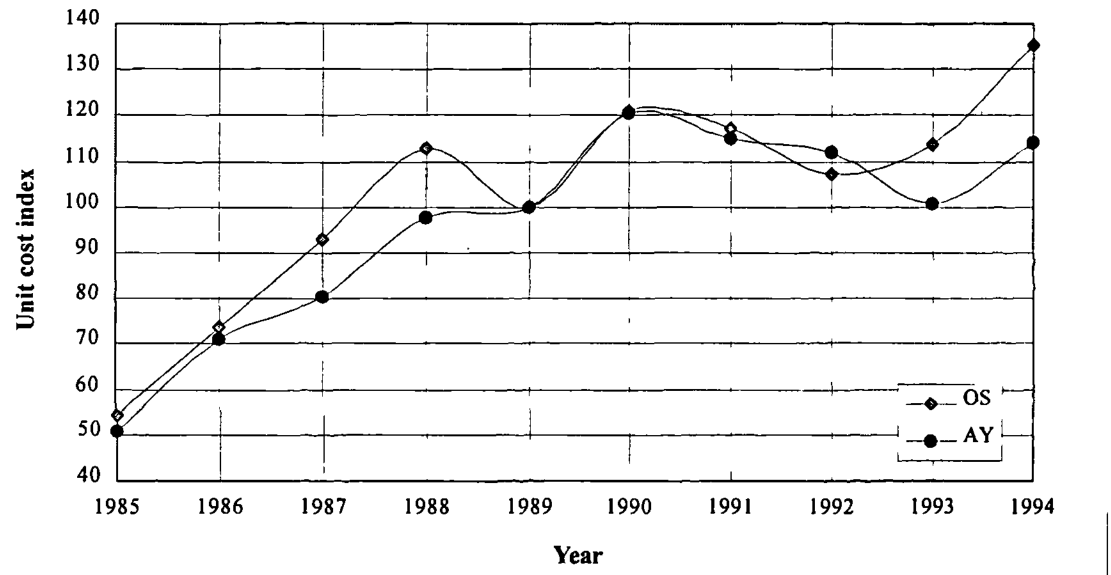


Figure 12.4 Flight personnel unit cost

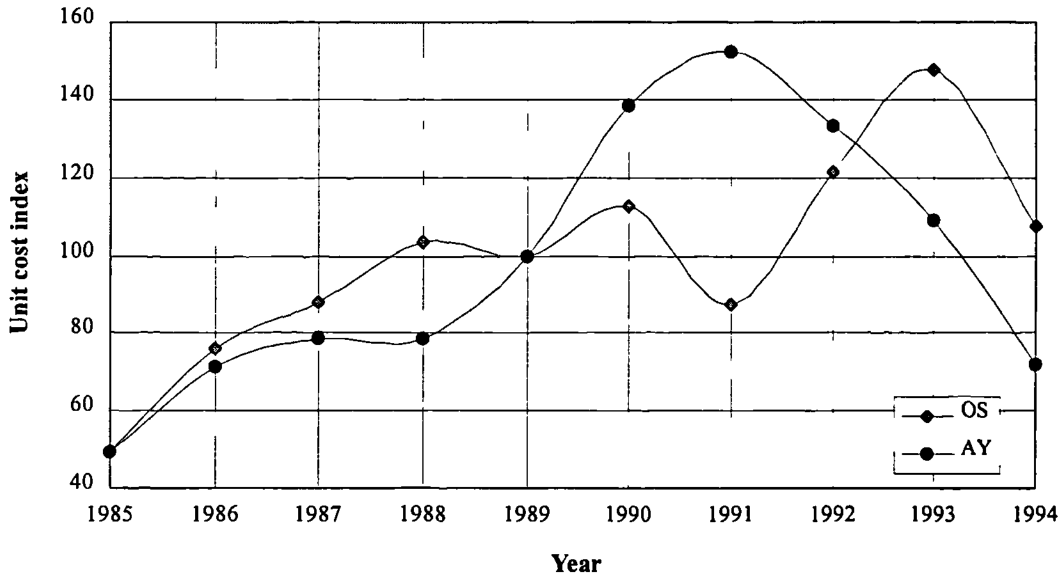


Figure 12.5 Cabin personnel unit cost

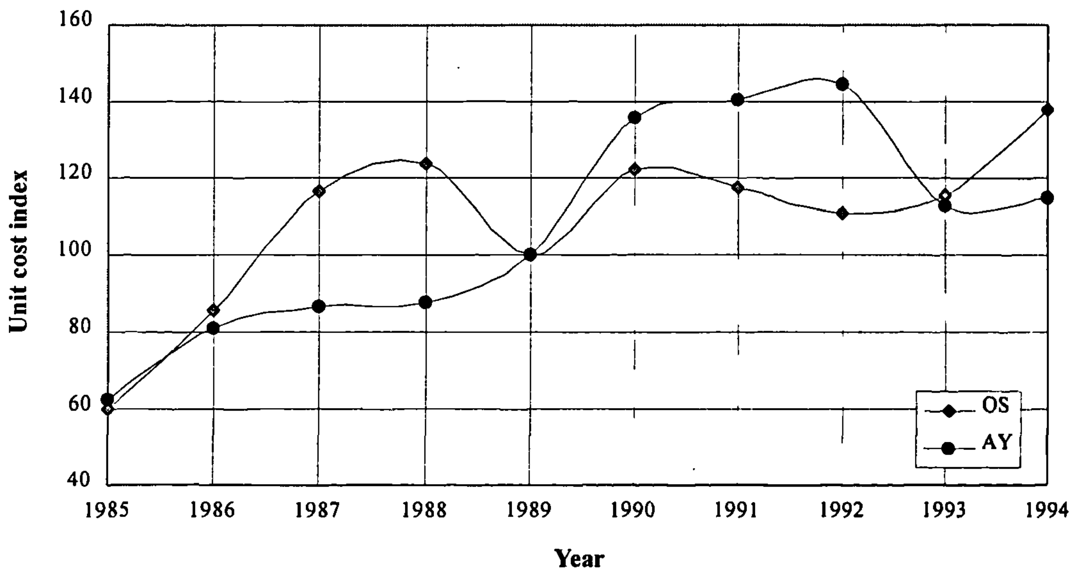


Figure 12.6 M&O personnel unit cost

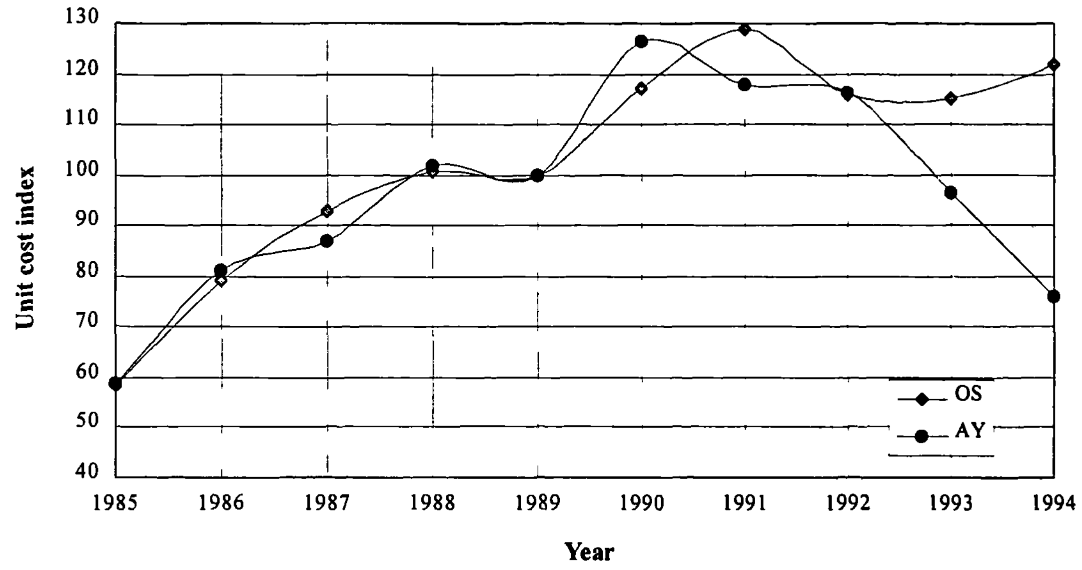


Figure 12.7 TSP personnel unit cost

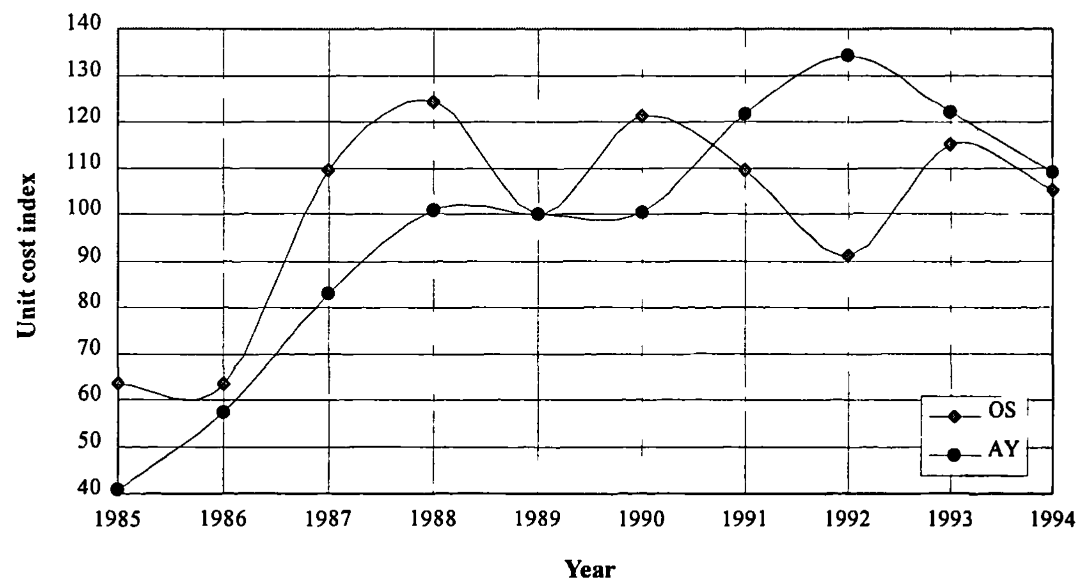


Figure 12.8 'Other' personnel unit cost

12.6.1.1 Discussion

For flight personnel (see Figure 12.4), the unit costs of Austrian and Finnair follow practically the same trends both before and after 1989. Before 1989, their unit costs rise almost linearly with a rate of 20 per year for Austrian and a rate of 16 per year for Finnair. Austrian unit cost falls in 1989 while that of Finnair levels out. However, they both rise at exactly the same rate over the period 1989-1990 before starting to fall gradually. Austrian's and Finnair's unit costs start to increase in 1992 and 1993 respectively at the same rate. Comparison of the changes in unit costs for the two airlines leads one to conclude that the EQA has not been successful in bringing down the flight personnel unit costs of Austrian Airlines. One possible reason for that observation is that it is quite difficult to lower flight crew salaries or to lay off flight personnel because of the strength of unions. The effect of the EQA is more on increasing flight crew productivity as will be observed later.

Unlike flight personnel, some effect of the EQA can be distinguished in the case of cabin personnel unit costs (see Figure 12.5). From 1985 to 1988, the cabin personnel unit costs of Austrian and Finnair follow generally the same rising trend. Austrian's unit costs fall slightly in 1989 and from 1989 to 1990, Austrian's unit cost increases at a rate of 14 per year while Finnair's unit cost increases at a rate of 39 per year. This is indicative of some alliance effect. Finnair's unit cost continues to increase after 1990, while, up to 1991, Austrian seems to be successful in lowering its unit costs. However, after 1991, its unit costs rise sharply at a rate of 30 per year. On the other hand, Finnair seems to have taken measures to decrease unit costs in 1991. Those measures have been successful as, from 1991 to 1994, Finnair's unit costs fell at a rate of 25 per year. Therefore, one can conclude that while the EQA was effective in the years immediately after its formation, that was not the case after 1991 when other factors drove cabin personnel unit costs up. After 1993, Austrian's unit cost fall; however, the rate of decrease is not significantly different from that of Finnair so that the presence of any alliance effect can not be supported.

Concerning M&O personnel unit costs, EQA effects are fairly distinguishable (see Figure 12.6). In the pre-alliance period, Austrian and Finnair unit costs follow an increasing trend, with the increase of Austrian being the sharper of the two (a rate of 21 per year). The increase in Finnair's unit cost is more gradual with a plateau occurring in the period 1987-1988. In 1989, Austrian unit cost falls dramatically. It rises back to 1988 levels in 1990; however, the trend of increasing costs which prevailed in the pre-alliance period seems to have been curbed. Indeed, after alliance formation, the costs cease rising and remain fairly stable. As from 1992, they start increasing gradually. In comparison, Finnair's unit costs start increasing as from 1988. Over the period 1989-1990, Austrian's unit cost rises at a rate of 11 while Finnair's unit cost rises at a rate of 18. Over the period 1990-1992, Finnair's unit cost continue to increase while Austrian's unit cost goes down. Therefore, one can conclude that the EQA has been effective in improving the M&O personnel unit costs of Austrian Airlines.

Changes in TSP personnel unit costs are shown in Figure 12.7. The unit costs of Austrian and Finnair follow near-identical paths before 1989, rising at approximately 13 per year. After alliance formation, the unit cost of Austrian and Finnair both increase. However, that of Austrian increases at a lower rate than that of Finnair indicating some alliance effect. The latter does not appear to be sustained after 1991. Indeed, as from that year, the unit costs of Finnair starts decreasing. In comparison, the unit cost of Austrian starts to rise as from 1992. Therefore, EQA effects on the TSP personnel unit cost of Austrian are not very apparent. That is a surprising result as EQA partners are known to co-operate quite extensively in that sector. One possible explanation could be that there has not been a decrease in TSP personnel, but rather a reorganisation with personnel based in the partners' countries being sent to other locations. Another explanation could be that the effect of the EQA has been very localised and can not be detected by an analysis of overall costs.

The changes in the unit labour costs of administrative and general personnel is shown in Figure 12.8. Both the unit costs of Austrian and Finnair increase in the pre-alliance period with the increase for Austrian being the sharper of the two. In 1989, Austrian's unit cost decreases sharply and, over the post-alliance period, fluctuates quite dramatically. Finnair's unit cost levels off in the period 1988-1990 and then increases over the period 1990-1992. It then decreases after 1992. A comparison of the two airlines indicates that some alliance effect was prevalent over the period 1989-1992. Furthermore, the shape increase in Austrian's unit cost in the pre-alliance period seems to have been curbed in the post-alliance period. Nevertheless, one should not conclude that such an effect was due solely to alliance formation as the EQA was not very active in the exchange and reciprocal use of general and administrative personnel.

The above analysis shows that while some effect of alliance formation can be observed on the unit labour costs of Austrian airlines in certain categories, it is not clearly apparent. In addition, the effect occurs mainly in the few years following alliance formation and decreases in magnitude with time. However, the EQA seems to have been very effective in improving the productivity of Austrian's personnel as will be seen in the next section.

12.6.2 Labour productivity

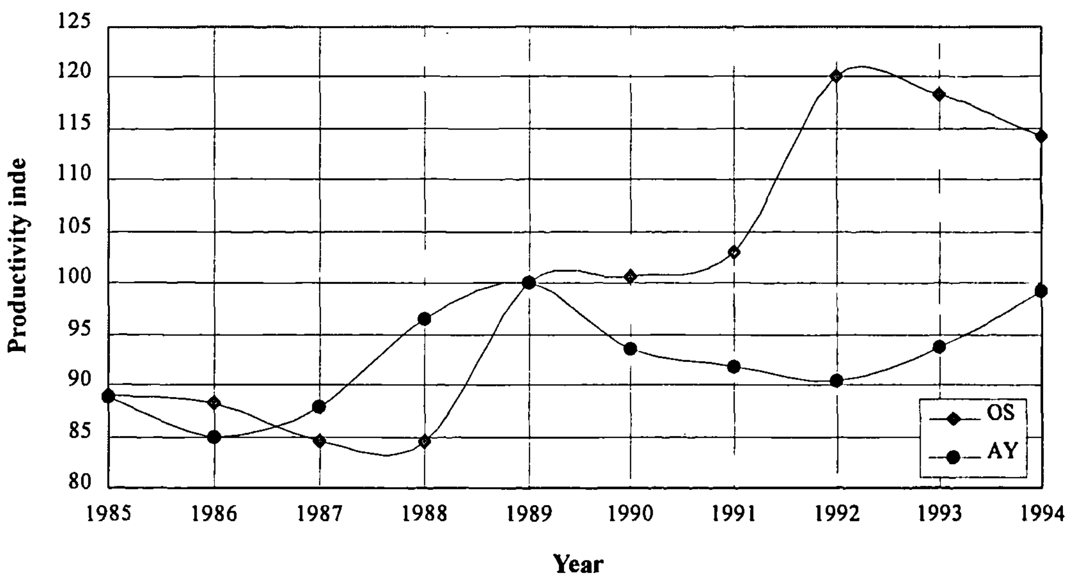


Figure 12.9 Flight personnel productivity

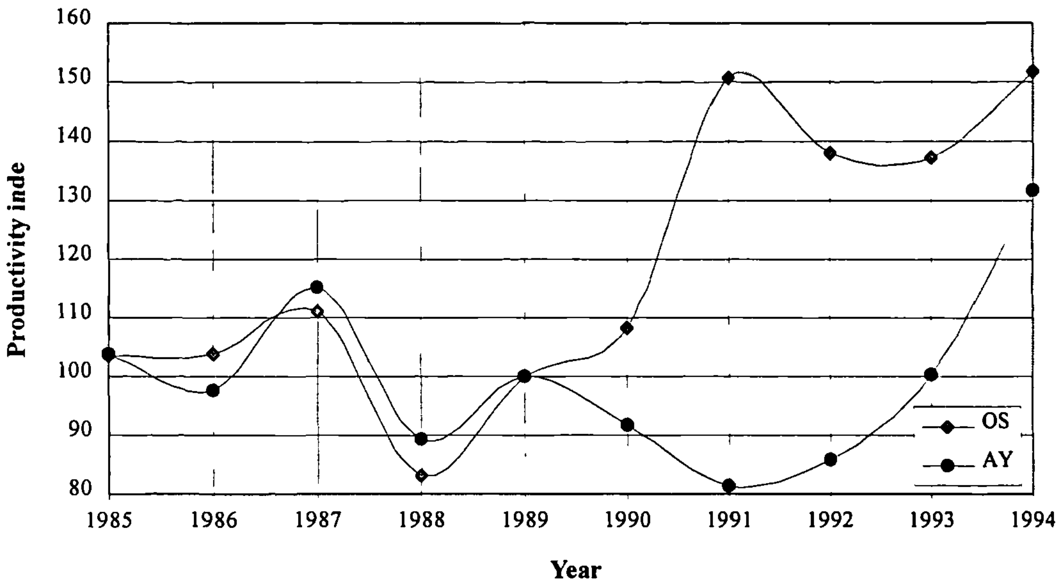


Figure 12.10 Cabin personnel productivity

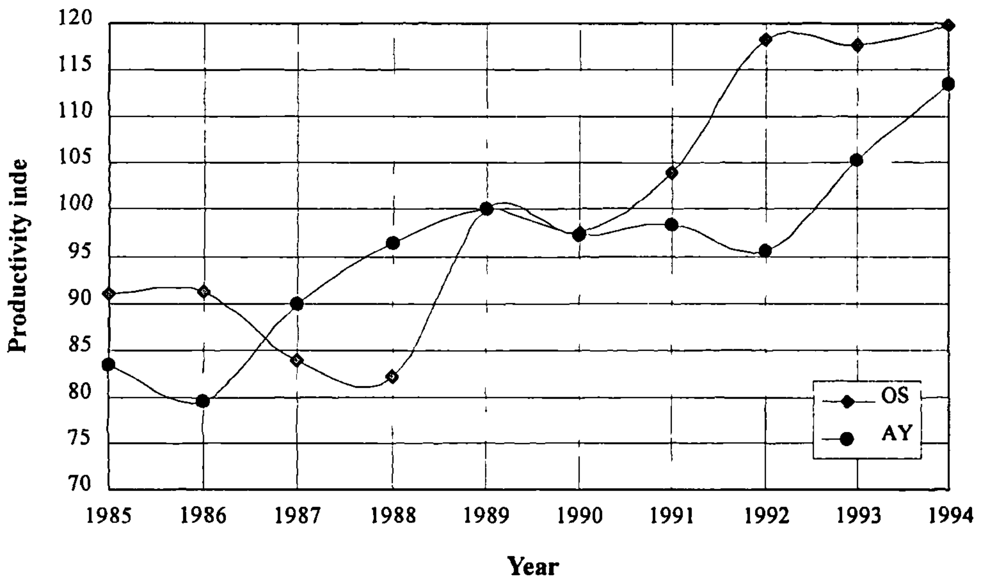


Figure 12.11 M&O personnel productivity

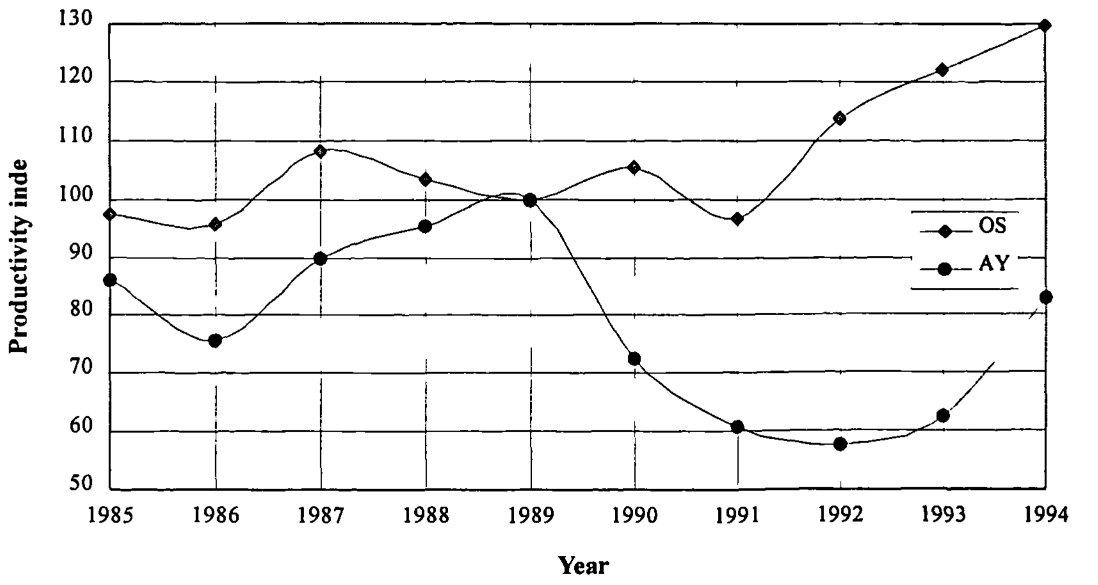


Figure 12.12 TSP personnel productivity

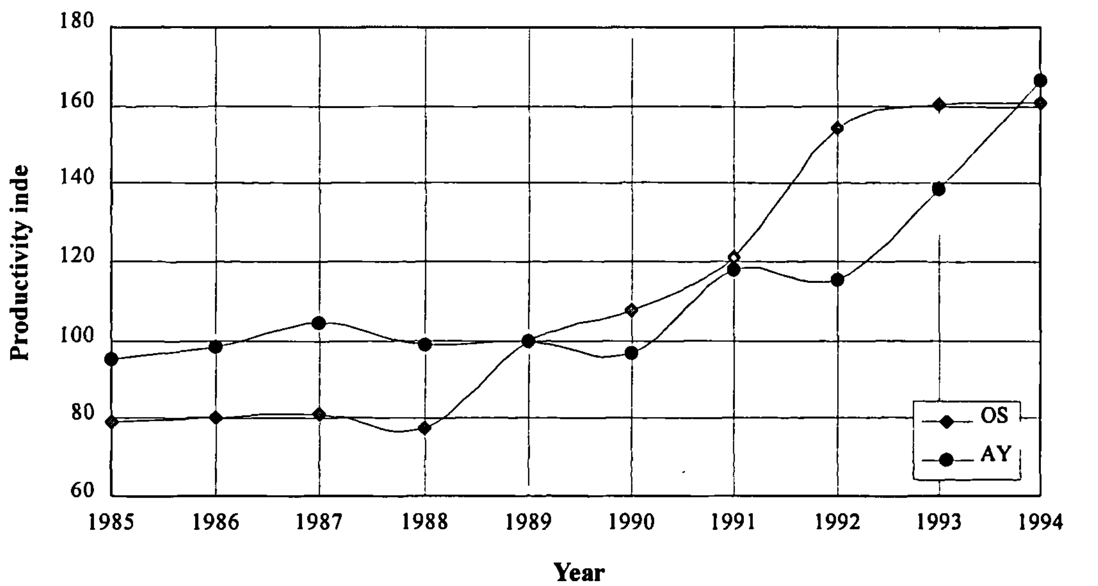


Figure 12.13 'Other' personnel productivity

12.6.2.1 Discussion

The change in flight personnel productivity is shown in Figure 12.9. In the pre-alliance period, the productivity of Austrian and Finnair flight personnel vary in generally the same way. It increases for Finnair over the period 1986-1989 while that of Austrian increases from 1988 to 1989. After 1989, the productivity of Austrian's personnel levels off but then increases sharply from 1991 to 1991. Conversely, after 1989, the productivity of Finnair's personnel decreases and does so until 1992. After 1992, Austrian's productivity decreases while that of Finnair starts increasing. Comparison of flight productivity trends in the few years following alliance formation leads one to conclude that the EQA has been effective in that field. However, after 1992, other negative factors have dominated over the alliance effects.

Changes in cabin personnel productivity are shown in Figure 12.10. In the pre-alliance period, the productivity of Austrian and Finnair follow near-identical paths, increasing from 1985 to 1987, decreasing sharply in 1988 and rising in 1989. However, they then follow completely different paths after 1989. From 1989 to 1991, Finnair's productivity decreases at a rate of about 10 per year. On the other hand, Austrian's productivity increases slightly in 1990, and then sharply in 1991 (a change in index of approximately 40). It then falls slightly in 1992 and starts increasing again in 1993. Finnair productivity increases fairly rapidly after 1991. Its rate of increase exceeds that of Austrian in the period 1992-1994. The conclusion of this comparison is that the EQA has been beneficial to Austrian in the years following alliance formation where cabin personnel productivity is concerned.

The same conclusion is reached in the case of M&O personnel productivity (see Figure 12.11). Productivity for Finnair increases from 1986 to 1989 while that of Austrian increases sharply in 1989. That could be indicative of the effects of co-operation as Finnair's productivity was decreasing prior to that. From 1989 to 1990, the productivity of both airlines decrease slightly and at the same rate. However, after 1990, Finnair's productivity maintains a slightly decreasing trend while that of Austrian increases at a rate of about 7 per year. Its productivity levels off after 1992 while that of Finnair increases at a rate of 10 per year. Therefore, it appears that some effects of co-operation have taken place in the three years after alliance formation. However, after that, these effects seem to have disappeared.

The productivity of TSP personnel in terms of number of passengers per employee is shown in Figure 12.12. Productivity for Austrian and Finnair follow generally the same trend from 1985 to 1987. However, from 1987 to 1989, Austrian's productivity decreases at a rate of approximately 5 per year, while that of Finnair increases at the same rate. However, after 1989, Finnair's productivity falls dramatically and continues to do so until 1992. On the other hand, that of Austrian increases slightly, and after a slight dip in 1991, continues its increase at a faster rate. This result is to be expected as co-operation in the EQA has been very much focused on cross-selling.

The productivity of 'other' personnel measured in ATK per employee is shown in Figure 12.13. The productivity of Austrian and Finnair follow generally the same trend in both the pre- and post-alliance periods so that one can conclude that the alliance had no effect in that field. This is to be expected as the EQA members expressed no intention of co-operating as far as administrative and general personnel is concerned.

This section has shown that, in general, labour productivity benefits in the post-alliance period have been more apparent than lower labour unit costs. The next section analyses the effects of EQA formation on the unit cost of facilities.

12.6.3 Cost of facilities

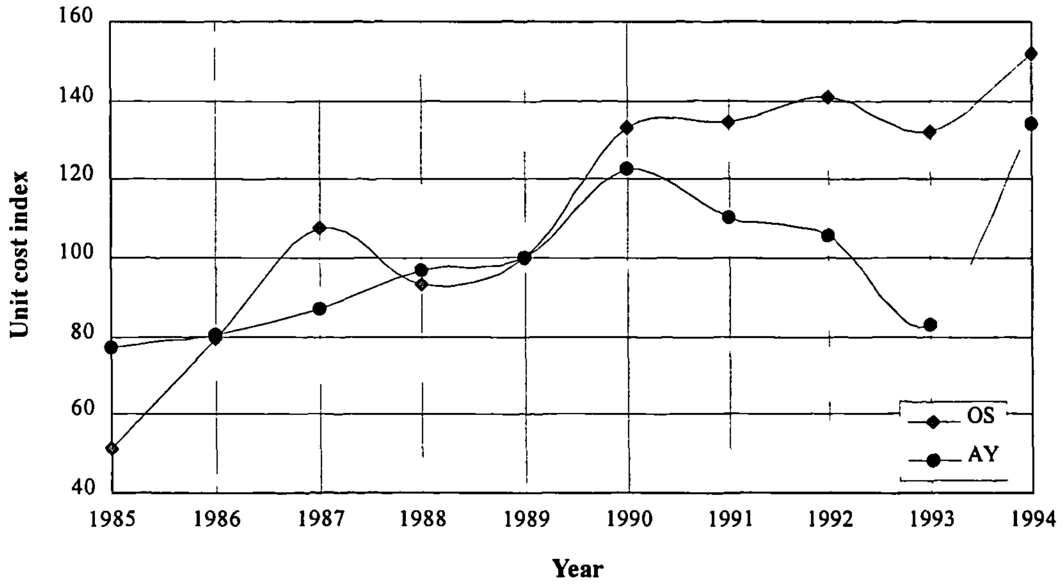


Figure 12.14 Station unit costs

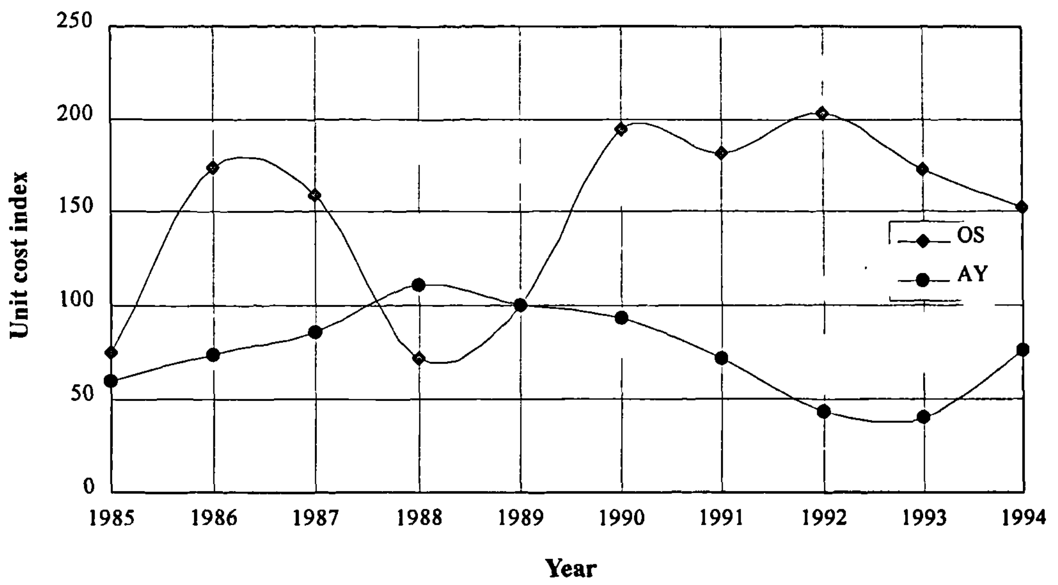


Figure 12.15 M&O unit costs

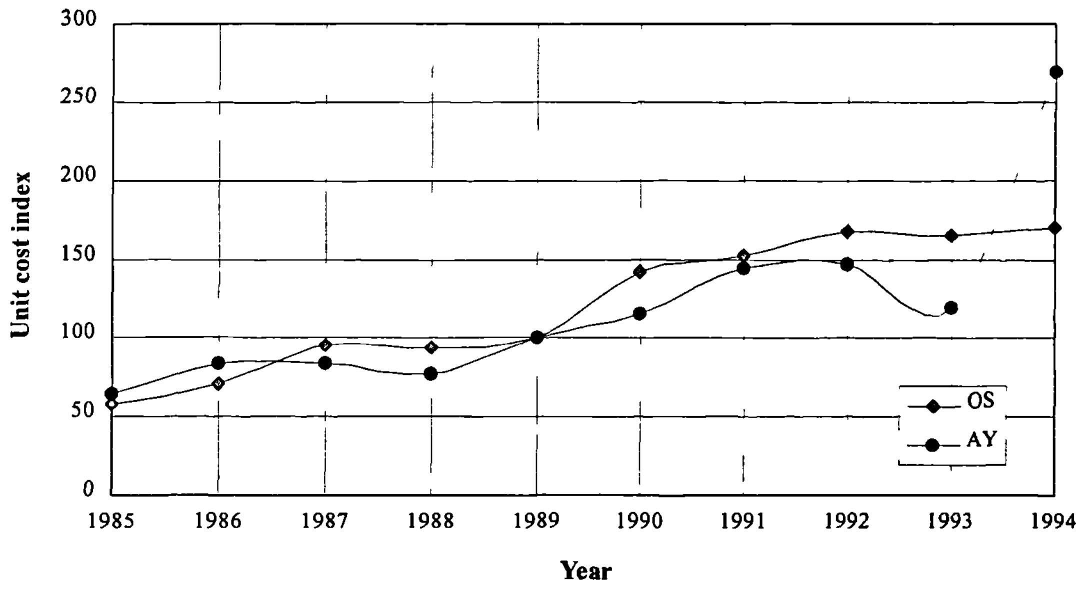


Figure 12.16 TSP unit costs

12.6.3.1 Discussion

Changes in station unit costs are shown in Figure 12.14. In the pre-alliance period, the unit cost of Finnair rises gradually while that of Austrian increases sharply over the period 1985-1987 before decreasing in 1988. In the year following alliance formation, the unit cost of both airlines increase with that of Austrian increasing at a slightly higher rate than that of Finnair. After 1990, Finnair's unit cost starts decreasing while that of Austrian remains more or less stable. After 1992, the unit costs of both airlines follow fairly similar trends, falling in 1993 and then increasing. Therefore, it can be concluded that the EQA has not been effective in reducing Austrian's station unit cost. This is an unexpected result as EQA members had actually targeted this area as a potential one for cost reduction. The absence of any appreciable result can be attributed to the fact that the EQA members were quite slow in exploiting the synergies in that field. Furthermore, the number of common stations was limited making detection of co-operation effects difficult.

The change in M&O unit costs after correcting for labour costs is depicted in Figure 12.15. Here again, the effect of the EQA is not very obvious. In the pre-alliance period, Finnair's unit cost increases gradually at a rate of about 20 per year. On the other hand, Austrian's unit cost fluctuates quite wildly in that period. After 1989, Finnair's unit cost falls at a rate of approximately 15 per year before starting to increase in 1993. However, that of Austrian increases sharply in the year following alliance formation and remains at high levels before starting to fall in 1992. Since Austrian's unit cost was rising at a time when Finnair's unit cost was falling, one can conclude that the EQA has not been effective in bringing Austrian's unit M&O costs down in the period 1989-1992. However, as from 1992, co-operation seems to be yielding benefits.

The same conclusion can be reached where TSP unit costs are concerned (see Figure 12.12). The unit costs of Austrian and Finnair follow practically the same paths in the pre-alliance and post-alliance periods. The only differences occur in 1993 and 1994 when Finnair's unit cost falls and then rises sharply. One possible explanation for the absence of any EQA effect is that the closure of sales offices has occurred only in those countries where the EQA partners are based. Increases in TSP costs in other countries could have counterbalanced the effect of the alliance, making detection of EQA effects on unit costs difficult.

The general observation from this analysis is that the alliance strategy has not lowered the unit cost of facilities of Austrian Airlines. However, it could be that EQA effects have not been detected because co-operation was implemented only in certain areas. The next section will analyse changes in aircraft utilisation.

12.6.4 Aircraft utilisation

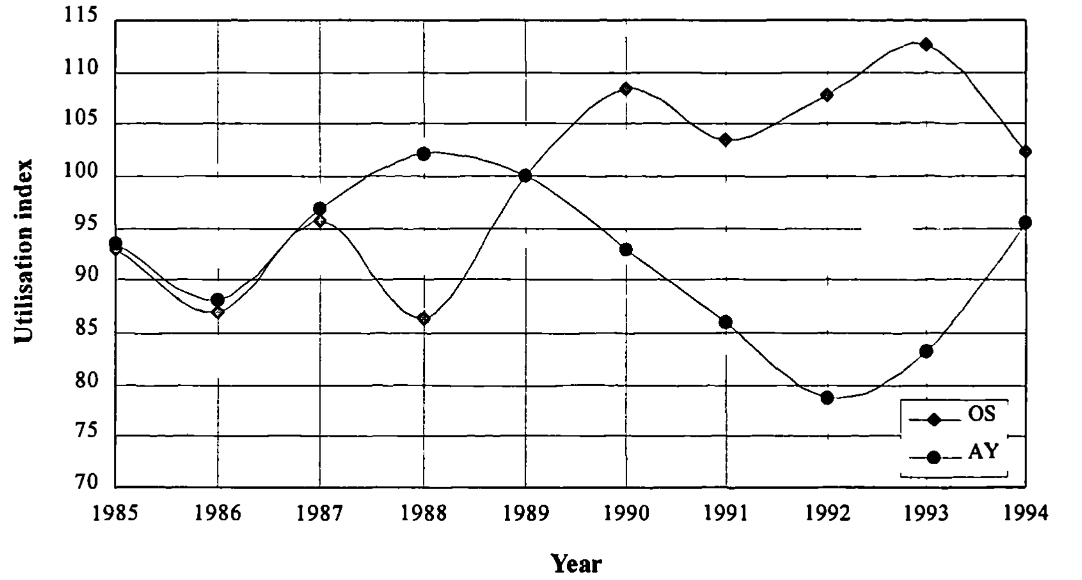


Figure 12.17 Aircraft utilisation

Figure 12.17 above shows the change in aircraft utilisation as measured by the number of flying hours per day. From 1985 to 1987, Austrian's and Finnair's aircraft utilisation follow near-identical paths, decreasing in 1986 and increasing in 1987. The only difference is in 1988 when Austrian's utilisation falls while that of Finnair continues to increase. However, in the year of alliance formation, Austrian's utilisation increase and continues to do so in 1990. After that, it remains at high levels. In comparison, Finnair's utilisation starts decreasing in 1988 and does so up to 1992 at a rate of approximately 6 per year. It then increases at a rate of about the same rate over the period 1992-1994. This indicates that the EQA must have been responsible for the improvement in Austrian's aircraft utilisation. Such an improvement comes from the reciprocal use of aircraft, and from the use of code-sharing which allows Austrian to re-assign certain aircraft to other routes in its network.

12.6.5 Purchasing

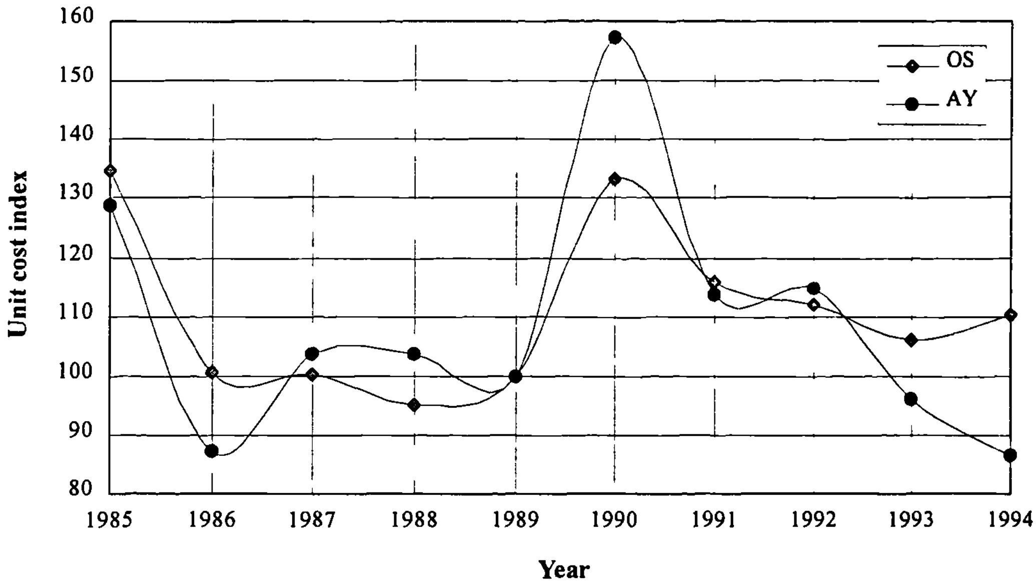


Figure 12.18 Fuel and oil unit cost

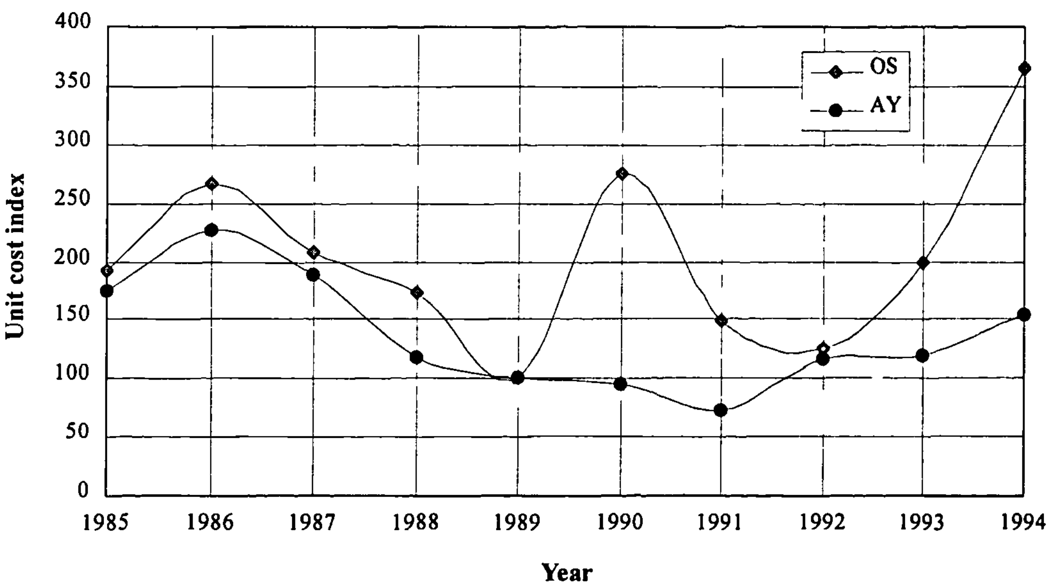


Figure 12.19 Insurance unit cost

Changes in fuel and oil unit costs measured in costs per ATK are shown in Figure 12.18. *A priori*, one expects to see a decrease in Austrian's unit cost over the post-alliance period as it benefits from a lower price obtained as a result of a greater bargaining power. However, this does not seem to have occurred. Indeed, over the period of analysis, the unit costs of Austrian and Finnair vary in similar ways. They both fall in 1986 and over the period 1986-1989. They then rise in 1990 as a result of the Gulf War, though it seems that Finnair has suffered more than Austrian in that year. Both then recover from that year with unit costs decreasing from 1990 to 1994.

The same conclusion is reached concerning unit insurance costs (see Figure 12.19). Here again, the unit costs of Austrian and Finnair follow similar trends and no apparent difference exists between them in the post-alliance period. The only difference occurs in 1990 when Austrian's unit cost rises sharply, only to fall back to Finnair levels in the following year. Therefore, in the area of purchasing, the formation of the EQA has not affected Austrian Airlines appreciably. The next section will consider alliance effects in cost areas which can not be categorised in the above-mentioned cost categories. Collaboration in the EQA has not really extended to those areas so that no change in Austrian's unit costs relative to those of Finnair is expected.

12.6.6 Other costs

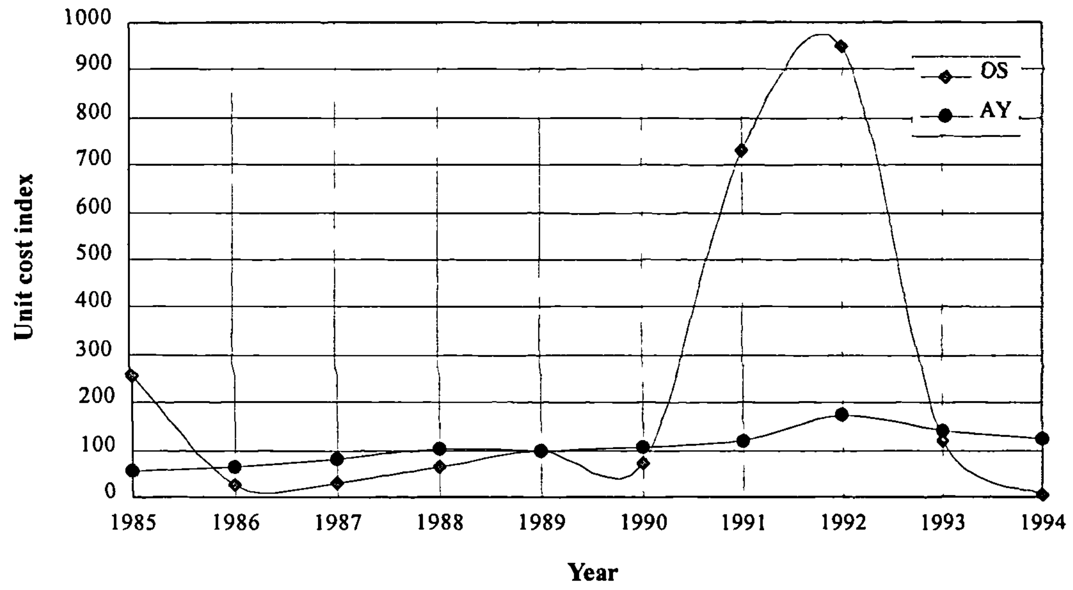


Figure 12.20 Rental unit cost

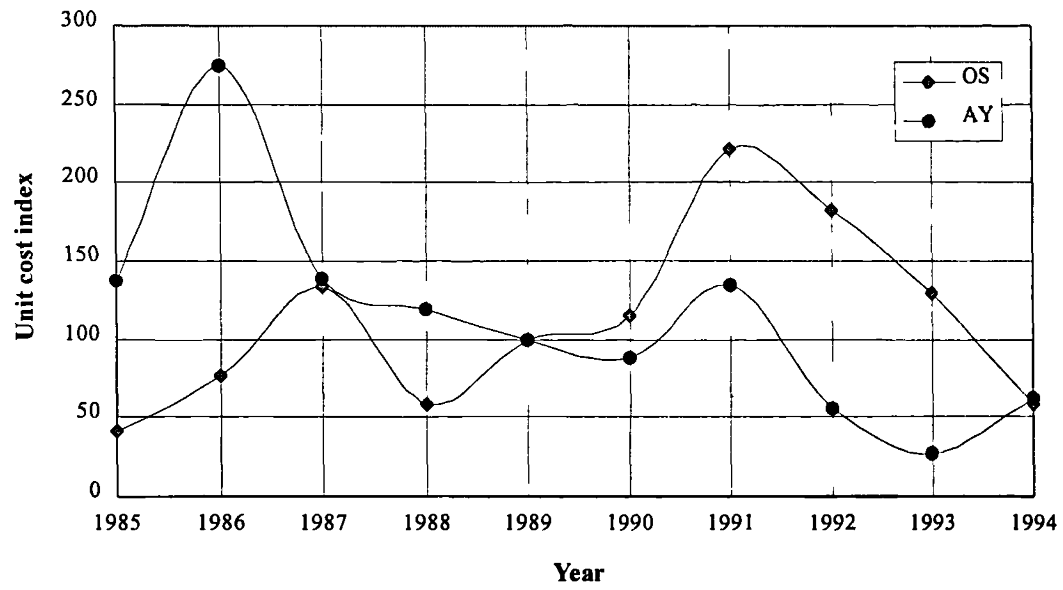


Figure 12.21 Training unit cost

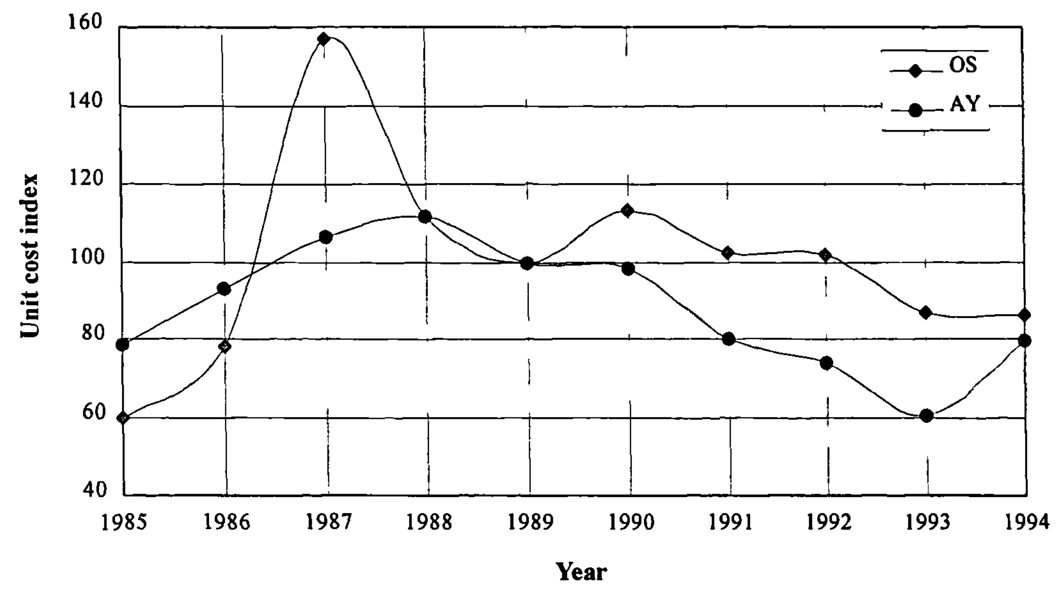


Figure 12.22 Administration unit cost

12.6.6.1 Discussion

Austrian and Finnair rental unit costs are compared in Figure 12.20. From 1986 to 1989, the unit costs of both airlines increase gradually. In the year following the formation of the EQA, Austrian's unit cost actually falls while that of Finnair continues to rise. However, one can not conclude that this is due to the EQA as the unit cost of Austrian appears to be affected by some external factor causing it to rise dramatically. This conceals any effect of the EQA on unit costs.

In the case of training and administration unit costs (see Figure 12.21 and Figure 12.22 respectively), Austrian and Finnair follow very similar paths and appear to be affected by the same economic forces. The rate of change of Austrian's unit cost is not very different from that of Finnair in the post-alliance period, hence the absence of any appreciable alliance effect.

12.7 Conclusion

This chapter has attempted to examine whether the production benefits have resulted from the formation of the EQA. Various unit cost and productivity measures were costs is perhaps too small to allow its detection in the overall TSP costs of the airline. The same applies for station costs.

Another area where the alliance strategy has worked is that of aircraft utilisation. While Finnair's aircraft utilisation fell in the post-alliance period, that of Austrian rose to higher levels. This comes as a result of using one's partner aircraft and also of code-sharing. However, it could also be the result of improved scheduling.

Contrary to expectation, the unit costs of fuel and insurance were not affected by alliance formation. In the case of fuel, this can be explained by the fact that fuel prices are subject to other influences which are beyond the control of the airlines. Also, the EQA does not seem to have put the mechanisms in place in order to purchase fuel and insurance jointly.

Finally, rental, training and administrative unit costs were unaffected by the alliance, most probably because co-operation did not extend to those areas, or because the intention of collaborating never went beyond that.

One has to realise that the changes occurring in the post-alliance period are not exclusively the result of alliance formation in the case of Austrian Airlines. Indeed, as from 1990, the aviation industry suffered the effects of the Gulf War and economic recession which forced airlines to investigate means of decreasing their production costs and increase the productivity of their labour force. Of course, the alliance strategy consisted of one of the ways of achieving that objective. However, other ways include the reduction in labour force, reduction of salaries, and negotiations to increase productivity. It is very difficult to separate alliance effects from the combined effects of all the measures taken to improve the financial situation of the airline. It was attempted to do so qualitatively using the Annual Reports of Austrian and Finnair. However, alliance-specific information provided in the reports was very sparse, and only served to highlight the dominance of internally-generated strategies. Therefore, the analysis provided in this chapter provides an indication of alliance effects at best.

The results of the analyses in this chapter are summarised in Table 12.3.

defined and applied to Austrian Airlines and Finnair over a period including the year at which the EQA was formed. Differences between Austrian and Finnair in the rates of change of unit costs and productivity in the post-alliance period (1989-1994) were examined to detect the effects of collaboration. Clearly, it is a combination of co-operative strategies and internally-generated moves which lead to the changes so that any observable differences in rates of change between the two airlines were considered to be only indicative of the effects of the EQA.

An analysis of the unit operating cost and unit labour cost revealed no appreciable alliance effect. In fact, Austrian performed worse than Finnair in the post-alliance period. However, this could be due to the means of measurement and to the fact that collaboration extended to specific, instead of all, areas.

No effects were observed on flight personnel unit costs which vary at the same rate in the post-alliance period for both Austrian Airlines and Finnair. However, some alliance effect was detected in the case of cabin personnel, M&O and TSP personnel. Some alliance effect is observed in the case of administrative and general personnel unit costs in the period 1989-1992. However, this is considered to result more from airline-specific moves than from the alliance as the literature has shown no indication that the EQA members intended to exploit the synergies in joint administration.

The graphical analysis has shown that an area which has clearly benefited from alliance formation is that of labour productivity. For all of Austrian's flight personnel, cabin personnel, M&O personnel and TSP personnel, productivity has increased at a faster rate than that of Finnair in the post-alliance period. Thus, even though Austrian has not managed to decrease unit costs for most of these personnel groups, it has succeeded in gaining productivity benefits as a result of collaboration.

When it comes to the use of facilities, the effects of the EQA are not clearly visible. Indeed, no difference exists between the rates of change in the unit costs of Austrian and Finnair so that the hypothesis of an EQA effect is not supported. One possible reason is that the effect of the EQA has been very localised. For example, the closure of sales offices occurred only in the partners' respective countries. The reduction in

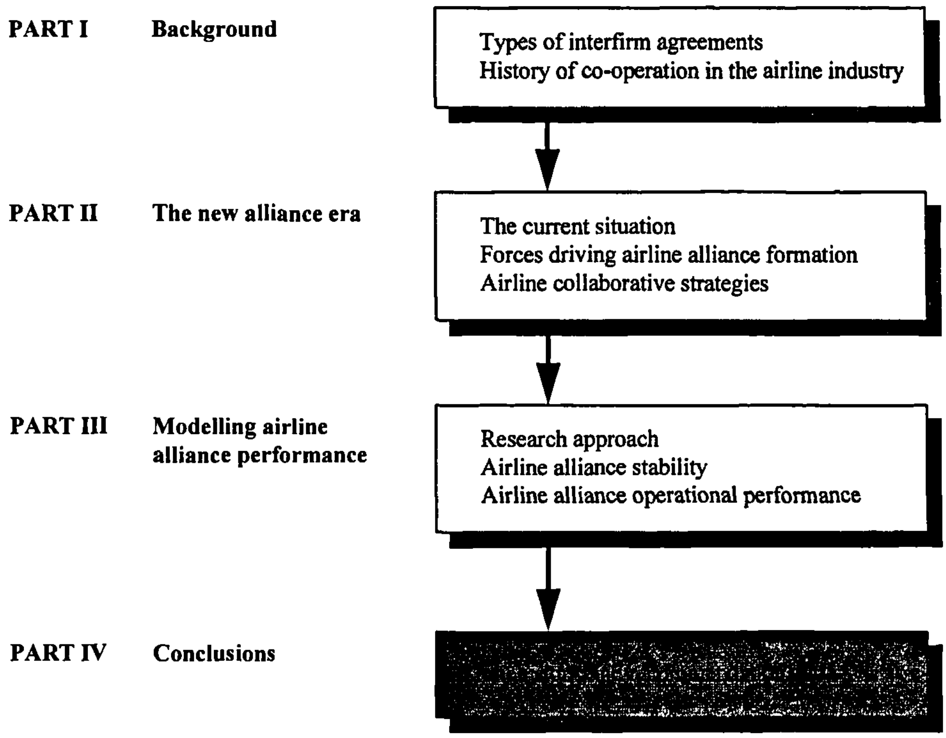
Cost/productivity item	Short-term effect	Long-term effect
Flight crew unit cost	None	None
Cabin crew unit cost	Small	None
M&O unit labour cost	Medium	Medium
TSP unit labour cost	Small	None
Other personnel unit cost	None	Small
Flight crew productivity	Large	Large
Cabin crew productivity	Large	Medium
M&O personnel productivity	Large	Small
TSP personnel productivity	Large	Medium
Other personnel productivity	None	None
Station unit cost	None	None
M&O unit cost	None	Small
TSP unit cost	None	None
Aircraft utilisation	Large	Medium
Fuel and oil unit cost	None	None
Insurance unit cost	None	None
Rental unit cost	None	None
Training unit cost	None	None
Administration unit cost	None	None

Table 12.3 Summary of the effects of the EQA on Austrian Airlines

PART IV

CONCLUSIONS AND RECOMMENDATIONS

This part will summarise the findings of this research and discuss the implications which they have on the structuring of airline alliances. Areas offering potential for further research in the field of airline alliances are also identified.



13. CONCLUSION

Introduction

In the previous twelve chapters, the evolution of the airline alliance phenomenon was examined and the factors contributing to alliance success were analysed both qualitatively and quantitatively. This chapter will summarise the findings of the research, and interpret their meaning to airline managers thinking of embarking on to the collaborative strategy. Like in most pieces of research of this kind, the models of alliance success which have been constructed here are not perfect, but have a certain number of limitations due to lack of data and underlying assumptions. The limitations will be presented in this chapter and potential means of improving the models will be discussed wherever relevant. During the course of this research, other fields of interest emerged. This chapter will conclude with those areas offering potential for further research.

13.1 The General Research Contributions

The main aim of this research is to analyse the factors contributing to airline alliance success. It is designed to be used as a management tool by airline managers who are contemplating the alliance strategy to increase the competitiveness of their airlines in the future. In addition, it effectively sets the groundwork for future research on airline alliances.

Five main contributions of this research can be identified. First, it has brought together the widely-dispersed (and sometimes contradictory) knowledge on airline alliances. Thus, one can have a general idea as to how the collaborative strategy has propagated in the airline industry. Second, it has analysed the current structure of the airline industry to reveal the various groupings as well as any underlying trends which airline alliances are following. Third, this research has analysed the forces which have driven airlines to co-operate. A conceptual model of airline alliance formation has been constructed, which lends itself to quantitative analysis. Fourth, this research has discussed the 'soft' management issues which are very important in ensuring the stability of airline alliances. By drawing on knowledge developed in the business and social sciences, it was possible to present guidelines on how to design a stable airline alliance. The fifth contribution of this research lies in the quantitative analysis of the performance of airline alliances in terms of goal attainment. The following sections will discuss the findings of the research and, from there, propose recommendations as to how airlines should go about choosing alliance strategies and implementing them.

13.2 Discussion Of Research Findings

13.2.1 Increasing need to ally

In the preliminary stages of this research, it was deemed important to analyse the direction which the trend in airline alliance formation was taking and to identify the forces which were driving airlines to collaborate more extensively. A conceptual model based on airline-specific socio-political and economic occurrences was constructed in an attempt to explain the pressing need for co-operation. Components of the model included deregulation/liberalisation, globalisation, privatisation, world-wide economic changes as factors leading airlines to collaborate. Regulatory barriers, both national and international, as well as nationalist barriers were identified as the forces which constrained airlines to ally rather than merge.

The conclusion that can be drawn from the qualitative model is that co-operation between airlines will continue to grow in importance as airlines find that they need to become more competitive and operate on a global scale in order to survive. Developing such skill organically can be time-consuming and costly and co-operating allows one to bypass such difficulties. However, legislative barriers currently dictating the behaviour of airlines seem to be resistant to any changes and mergers between airlines based in different continents seem unlikely to be easy in the near future. In fact, airline mergers and acquisitions could become increasingly difficult as aviation markets consolidate into blocks such as the European Union. Therefore, it is predicted that the formation of airline alliances will continue to occur and the airline industry will eventually consist of a number of four or five groupings constituted of distinct airlines co-operating closely together.

Hence, it is recommended that airlines form part of at least one grouping in order to survive and grow. Opting for a go-it-alone strategy could prove fatal to airlines as they could find it increasingly difficult to reap the economies of scope and density necessary for profitable operation. The only option viable for future operation could turn out to be niche markets for those carriers. By forming part of a grouping, airlines would be able to benefit from better access to global markets and from traffic feed originating in a number of world regions. They will also find it easier to compete for market share and take price initiatives.

In many cases, the urgency of co-operation has lead to airline alliances which did not have much of a sound rationale behind them and which did not take into consideration the issues essential for their stability. The next section will present the findings of the qualitative analysis of the structure of airline alliance relationships.

13.2.2 Factors determining airline alliance stability

The eventual success of an airline alliance depends greatly on its internal stability. Indeed, many of the difficulties experienced by current airline alliances occur because the importance of internal alliance stability was overlooked during the negotiations and afterwards. This results from the fact that airline managers have long been accustomed to operating alone in their business environment, and that the concept of collaboration is alien to them. Therefore, a major success factor of strategic airline alliances is a thorough understanding of the 'soft' management issues inherent in their workings.

For that, a conceptual model of the development of alliances was devised, based on knowledge derived from the business and strategy disciplines. The model consists of three stages, formation, operation and evolution. A number of factors need to be given due consideration when the alliance is any one of these stages in the course of its development. The following recommendations can be made based on that conceptual model.

First, it is important to set specific criteria which the potential partner will have to satisfy. Such criteria need to be based on the compatibility between the airline and its potential partner. Four types of compatibility are identified as important: cultural, strategic, functional, and goal. It is anticipated that cultural compatibility can be hard to obtain as the need to achieve global coverage mandates alliances between airlines based in different continents. However, if the two airlines have fairly similar ways of managing their operations, this will constitute an advantage. If the partners are culturally very different, then efforts aimed towards understanding one another have to be promoted. Strategic and goal compatibility refer to the long-term objectives of the partners. Conflict of objectives will certainly lead to alliance failure. Functional compatibility refers to the style of management which, if incompatible, can cause instability within the alliance. After having defined the criteria for fit, the airline can then go to the next step which is to apply them to screen out potential partners. It is recognised that with the limited number of attractive partners, all the criteria will not be satisfied. Therefore, a certain degree of compromise is necessitated and it is up to the airline to decide on which criteria to attach more weight in its decision-making process.

Once the partner is identified, the airline can go ahead and create the alliance. To ensure that the alliance idea is accepted within the airline, managers have to get key personnel to agree to it and thus, gain internal support. The signing of the alliance contract is not an end in itself. Indeed, managers have to devise a strategic plan which will set out the course of the alliance, and find ways in which it can be used to create value. Then, it is of utmost importance to communicate to the personnel of both airlines what co-operation will be based upon. If it is unclear to the personnel as to how the alliance is operationalised, little progress will be made.

At the formation stage, and also during the operational phase, there is an ongoing interaction between personnel from both airlines. It is necessary to understand that interaction and how it can promote alliance stability. Three issues need to be given due consideration: commitment, trust and power/control. The feeling that one's partner is committed to the success of the alliance encourages one to be committed as well and reinforces the bond between the airlines. Unilateral commitment of resources (personnel or capital) or the promise of exclusivity are ways to demonstrate commitment. Equity purchases can help an airline make its partner aware of its commitment to the alliance. However, it is recommended that the equity be small so that it does not convey the impression that the airline is attempting to control its partner.

The feeling of trust also needs to be promoted within the two companies. Indeed, if one of them feels that the other is using the alliance to its own advantage, then it is most likely to leave the partnership. Feelings of trust are promoted at the negotiation stage and are also generated by making non-recoverable investments to the alliance. Power imbalances can undermine interfirm relationships. These power imbalances are most likely to arise between airlines of significantly different sizes such as major and regional/commuter airlines. Indeed, there is the danger that the former can abuse its dominant position and act opportunistically. Commitment and trust can help alleviate and eventually eliminate the feeling of vulnerability felt by the weaker partner. The law of contract can also be used by the weaker partner to control its stronger partner to a certain extent. However, the implementation of the law can be a costly and time-consuming process.

An issue which is frequently overlooked by alliance managers is that alliances evolve as a result of changes in both external and internal circumstances. Thus, the importance which an airline attributes to its alliance can change over time. This can lead to instability if the alliance has not been designed to cope with such changes. Therefore, it is necessary to include flexibility to change at the design phase of the alliance. Mechanisms should also be implemented to monitor the alliance regularly so that changes are detected soon enough to take the appropriate corrective action.

Finally, the alliance partners have to recognise that dissolution can take place. Too often, this has been overlooked and the separation has been lengthy and painful as the partners spend large amounts of time deciding who owns what. Therefore, it is important to decide upon dissolution procedures at the design phase of the alliance.

The second criterion of airline alliance success is the achievement of the set objectives. The next section will present the findings of the quantitative analyses and, from there, make recommendations to airlines.

13.2.3 Critical alliance performance factors

13.2.3.1 Economies of scale

A belief prevails that alliances can be a means of reaping economies of scale. This research has empirically shown that belief to be untrue. Indeed, it was found that constant returns to scale exist the airline level and, more interestingly, at the alliance level. In other words, this implies that the alliance strategy does not enable an airline to lower its unit costs solely because it has caused the airline to increase the scale of its operations. Therefore, it is recommended that airlines do not adopt the alliance strategy if their aim is to lower their unit costs just by increasing their size.

13.2.3.2 Economies of scope and density

Economies of scope are reaped when an airline is able to operate on a larger network and, as such, become more competitive. Density economies derive from an increase in traffic on a network of fixed size, leading to higher load factors and lower unit costs. The variables which were observed to affect alliance success in those areas are the change in 'effective' network size, partner network complementarity, the change in alliance inter-hub capacity, the change in alliance travel convenience and the change in the level of competition experienced by the alliance. The implications of each of these factors are discussed next.

The 'effective' network size of an airline is the total number of points in its network and the points in its partner's network which can be marketed as though they were its own. The regression model indicates that airlines should look for a partner with a large network in order to attract substantial additional traffic onto its own network. In addition, a partner with a large network enables the airline to benefit from appreciable traffic feed. The size of the partner's network is also important in that the linking of FFPs will be more effective since they can be deployed onto a large network. Therefore, passengers have a greater choice of destinations on which to collect and use FFP points. If the partner with the desired network size is not available, it is possible for the airline to reap the benefits by allying with a number of airlines with smaller networks. This strategy could be desirable in that the airline can have access to a number of regions; however, managerial difficulties in dealing with a large number of alliances can be encountered.

Network complementarity refers to the degree of overlap between the partners' networks. The model indicates that airlines should seek for partners whose networks do not overlap substantially with its own for the alliance to be successful. If the alliance has already been formed, then the partners need to take the necessary steps to eliminate the duplication problem. Network complementarity and hub separation were found to be highly correlated implying that partners with close hubs are very likely to have substantially-overlapping networks. Therefore, for airlines seeking scope and density economies, it is desirable for them to select partners based in other continents/world regions. However, airlines may wish to ally with partners based very close to achieve a strong position in the region.

The inclusion of the change in the inter-hub capacity into the model was dictated by the necessity to control for that variable. Indeed, it is known that changes in frequency (and hence total capacity) can stimulate traffic and bring about market share gains. Therefore, any change in inter-hub capacity provided by the alliance is likely to increase its passenger traffic on that route. In the model, the variable had the expected positive coefficient. However, the fact that the alliance was the unit of analysis masked the possibility that the increase in frequency was not alliance-initiated, but a unilateral decision taken by one of the airlines in the partnership. An increase in inter-hub capacity is recommended for the alliance because of the traffic stimulation and market share increases it can bring about. In addition, it could be that increasing the inter-hub capacity integrates the two networks further and makes them appear as a single entity to the consumer.

Travel convenience refers to the average length of time a passenger has to wait for his/her connecting flight. A decrease in connect time was observed to contribute significantly to alliance success. Therefore, it is recommended that alliance partners make efforts to co-ordinate their scheduling activities at connecting points in their networks. By matching their flights such that departing and incoming flights lie as close as possible to each other, they can increase the amount of traffic on their networks. Shorter waiting times make the alliance flight option attractive to passengers and promote it to better positions on CRS screens.

Level of competition was also found to be an important determinant of airline alliance performance. As expected, an increase in competition levels will hinder alliance success. Therefore, the potential reaction of competitors needs to be carefully assessed when formulating the strategic plan of the alliance. A problem of simultaneity between variables is recognised here. Indeed, the formation of an alliance will cause competitors to react. They might either move out of the market or, more likely, try to increase their competitiveness. These reactions will, in turn, affect the performance of the alliance. The model could be improved by taking this simultaneity issue into account.

Of the variables found to affect airline alliance success, the level of competition was found to be the one of highest relative importance. It is followed by the network size, inter-hub capacity, network complementarity and travel convenience in order of importance. Airlines have virtually no control on the reaction of competitors. Therefore, it is recommended that they concentrate firstly on the network size of the prospective partner as a first screening criterion followed by the complementarity of their networks. Once the alliance is formed, the frequency of service between hubs should be increased and incoming and departing flights should be matched at connecting airports to decrease the waiting time of passengers.

One of the controversial findings of this piece of research is that alliance success is unaffected by fare levels. However, this can be explained by the fact that the measure of fares in the alliance models was not very appropriate. An ideal measure would have been the average yield obtained on the network centred on the hubs of the partners. Unfortunately, such information was unavailable so that the alliance average yield on the whole of the partners' networks was used instead. However, the use of average yield is not very appropriate in this analysis as airline alliances operate only between selected hubs and not on the whole network of the partners. Averaging fares over the partners whole networks renders the detection of alliance effects difficult.

A second controversial finding was that alliance performance is independent of the degree of seamlessness between the partners' respective levels of service, both in flight and on the ground. One can therefore conclude that passengers are not concerned with the differing levels of service which they might experience when transferring from one airline to its partner. This could be true in the case of low-yield passengers who are more concerned about reaching their destination. This would be less so in the case of business-class passengers where in-flight service levels and ground treatment are important in their choice of airline. The fact that business-class traffic constitutes a low proportion of the total traffic carried by the alliance could explain the absence of the seamlessness variable in the alliance models. However, these conclusions should be treated with caution as the degree of seamlessness was somewhat crudely measured in this research. More in-depth research is required to improve the measure for inclusion in the model.

13.2.3.3 Market power

Alliance market power exhibits itself on inter-hub and origin-destination (O-D) markets. On the inter-hub route, the alliance dominates the hubs at both ends of the market and can make entry of competitors very difficult. The domination of the alliance on the inter-hub route can also cause competitors to move out of it as they find it increasingly difficult to compete. EQA, KLM-Northwest and British Airways-USAir were observed to experience large increases in market share on inter-hub routes after those alliance were formed. Therefore, an increase in frequency on inter-hub routes is recommended to inhibit the ability of other airlines to compete and therefore, gain control of that market.

On O-D markets, quantitative analysis pointed to alliance frequency, connect time and quality of connection as alliance market share determinants. These results imply that alliances should increase the frequency of service in origin-destination markets to gain more market power. Indeed, an increase in frequency makes the alliance option more attractive to the consumer and increases its chances of being selected. The linear models predicted an increase of around 2% in market share for an increase of one in average weekly frequency. Also, partners should make efforts to decrease the connect time as that variable was observed to be of value in explaining the change in market share of the alliances considered in the study. A third conclusion of the analysis is that alliances should strive for most of the O-D markets to involve only one stop. Furthermore, code-sharing is to be encouraged in order to present the flight as on-line rather than inter-line as it was shown to increase alliance market share.

Another finding of this alliance market share analysis is that competitors are very likely to react swiftly by increasing their service frequency, decreasing average connect time and increasing service quality. For the alliances considered, increases in service quality were observed to form the major strategy of competitors to counter the effects of the alliance. Therefore, it is important for prospective partners to realise that the market power benefits expected from allying are very likely to be affected by the reaction of their competitors. In particular, promotion of multi-stop services to one-stop status and an increased use of code-sharing are the major competitor reactions to be expected. Therefore, the potential reaction of competitors to alliance formation needs to be assessed in the analysis of the alliance future benefits.

As in the model of scope and density economies, it was not possible to include fares in the market power models because of the lack of fare data. Usually, fares are substituted for by yields. However, in this case, the actual fare is required as the econometric analyses are of a cross-sectional type involving a number of origin-destination markets served by the alliances before and after alliance formation. Inclusion of fares could improve on the explanatory power and the prediction accuracy of the alliance market share models.

13.2.3.4 Production benefits

Lower unit costs, improved productivity and increased capacity utilisation are the main objectives of airlines combining their operations on the production side. In order to identify the areas where alliances offer the greatest potential of achieving these goals, a case study of Austrian Airlines was performed.

In general, it was observed that the alliance was generally not successful in decreasing unit labour costs. Small decreases in the unit costs occurred only in the cases of cabin crew, maintenance and overhaul, and ticketing, sales and promotion personnel. This can be explained by the fact that it is very difficult to lay off personnel owing to the strength of unions. However, the productivity of all the above-mentioned personnel as well as that of flight crew improved considerably after alliance formation. Aircraft utilisation was also greatly improved after alliance formation probably as a result of code-sharing and cross-utilisation of aircraft.

Unit costs of facilities were not observed to be affected by EQA formation. However it is known that the EQA partners have closed down a number of sales offices and taken over one another's operations at a certain number of stations. The fact that these measures have been very localised in the airline's network could explain why they could not be detected in an examination of the overall costs of the airline. The unit costs of fuel, insurance, rental and administration were also observed to be unaffected by alliance formation. This is possibly because the EQA partners have been very slow in implementing joint strategies in those areas and there also seems to have been a lack of direction as to where and how to operationalise the alliance.

The main finding of the analysis of alliance production benefits seems to be that labour productivity and capacity utilisation are the main areas where it is easier and quicker to reap benefits via alliance formation. Therefore, it is recommended for airlines to concentrate on them at the initial stage of alliance formation. Once tangible benefits are obtained and hence faith in the alliance is reinforced, the partners can progress to the more difficult area of unit cost reduction.

It is important to note that the analysis of the production benefits has been seriously hampered by difficulties in separating alliance and non-alliance effects and by the lack of an appropriate case study subject. The EQA appears to offer potential for research as it has been in existence for a sufficiently-long time and has been geared towards exploiting the production benefits of allying. However, it seems to have been very slow in implementing the necessary collaborative measures. Other alliances such as British Airways-USAir and KLM-Northwest have also collaborated on the production side. However, the fact that co-operation has been only on the transatlantic makes the detection of its effects by an examination of overall costs virtually impossible. Costs and productivity data specific to transatlantic operations are not available from the concerned airlines. Therefore, it is recognised at this stage that further in-depth research is necessitated in the area of co-operation on the production side. The research should preferably be done in collaboration with an airline involved in such alliances in order to have access to data. A methodology also needs to be developed to isolate the alliance effects.

13.3 Policy Recommendations

From this research, the following recommendations are made to help airline managers design stable and effective alliances:

- Ensure that the prospective partner is compatible with the airline. The compatibility condition should be satisfied in four areas: culture, strategic intent, function and goal
- Ensure that the alliance idea is accepted by key personnel and that the means by which co-operation will take place is clearly communicated to all personnel
- Ensure that commitment to the success of the alliance is conveyed to the partner, and that an environment promoting trust prevails during the negotiation stage

- Understand that the alliance will evolve and therefore build in mechanisms allowing changes to be implemented in the agreement
- Recognise that the alliance is not eternal, and therefore decide upon the dissolution procedures when the alliance is being designed
- Avoid using the alliance strategy if the objective is to achieve scale economies
- Select a partner with a large network
- Select a partner with a complementary network
- Increase the frequency of service between the partners' hubs
- Match the partners' flights at the connecting hub so that passenger waiting time is decreased
- Anticipate the reaction of competitors to the formation of the alliance
- Make use of code-sharing to promote the alliance's services from interline to intraline
- Bring multi-stop origin-destination services to involve one-stop only
- Concentrate on improving the productivity of their personnel and the utilisation of their aircraft by using the alliance before moving on to decreasing unit costs of production.

13.4 Proposals For Further Research

While carrying out this study, a number of areas offering potential for further research were identified. They are discussed below.

1. This research has been hampered by the fact that the airline alliance phenomenon is relatively new. Therefore, for most of the alliances considered, only two or three years of data were available for quantitative analysis. For alliance effects to be fully revealed, a longer time period is required. Therefore, it would be necessary to perform an analysis similar to the one in this study in a few years time when data over a longer time period is available.

2. Another area of research involves the calibration of the conceptual model of the forces driving airlines to form strategic alliances. From the qualitative analysis carried out in Chapter 5, a number of hypotheses can be formulated and statistically tested in

order to identify those forces which are most influential in the model. Thus, a better insight into the antecedents of airline alliance formation can be obtained.

3. This study has focused on strategic airline alliances between airlines of fairly equivalent size and strengths. It would be useful to investigate the success factors of airline alliances between airlines of unequal strengths, such as those between major airlines and feeder carriers, as this type of alliance is also becoming quite common. The managerial implications of such alliances are anticipated to be quite different from alliances between equal partners as the power and control issues in such a partnership are very much prevalent.

4. Most of the current strategic airline alliances are formed between European carriers or between European and US carriers. The only two Asian carriers involved in a major airline grouping are Thai Airways (allied to Lufthansa), Qantas (allied to British Airways) and SIA (allied to Swissair). For that reason, the analyses in this study have focused exclusively on European and European-US alliances. It is anticipated that the number of strategic airline alliances involving an Asian carrier will increase in the future owing to the pressing need to access that region. Therefore, it would be useful to extend this study to encompass Asian airlines in order to detect any differences in success factors.

5. The market power model in this research was observed to suffer from the effects of simultaneity between a number of the variables, hence the use of the logit model. While this model explains the attractiveness (utility) of the alliance option as compared to that of its competitors, it can not be readily used to estimate changes in market share as a result of a change in variables. One means by which to calibrate the simultaneous model would be to apply the two-stage least squares (2SLS) regression technique. This would require the availability of a number of so-called 'instrumental' variables which are not affected by those in the model, but which can be used to estimate those variables simultaneously related to the dependent variable.

6. Finally, a fifth area of research would concern the production benefits of airline alliances. This study has attempted to analyse these benefits. However, it has been

hampered by a number of methodological problems. Further research is required in that field, with each of the cost categories constituting a study in their own right.

APPENDICES

The following sections give the raw data which have been used in the numerical analyses in this research.

APPENDIX A: Raw data used in section 9.4.1

Airline	$TCOST/ASK_a$ (Cts./ASK)	ASK_a (mn.)	LF_a (%)	ASL_a (km.)	$LCOST/ASK_a$ (Cts./ASK)	ASK_A (bn.)
Aeromexico	10.43	10509648	64.5	965.30	2.05	361.90
Air Canada	9.48	22774347	62.6	1509.06	-	316.49
Air France	14.89	50119395	73.1	1766.49	-	206.78
Air Lanka	6.69	3683204	71.2	2414.04	-	14.09
Air Tanzania	12.57	152931	56.9	613.28	-	0.15
Air Zimbabwe	14.51	666416	73.2	753.52	-	0.67
Alaska Airlines	7.87	12115311	62.8	1110.90	2.59	145.33
Alitalia	11.77	30258736	68.5	1000.79	3.97	100.07
America West	6.17	19631336	67.9	1087.23	1.61	19.63
American Airlines	8.91	159039499	64.8	1671.56	3.25	234.21
ANA	18.62	38522068	62.9	1057.71	3.38	185.29
BA	9.22	86231812	71.1	1639.43	1.95	238.85
British Midland	24.94	2215795	61.2	486.28	4.76	388.57
CAI	9.95	20715067	68.3	1645.51	3.43	284.64
Cathay Pacific	8.23	32710185	71.3	2979.69	2.15	283.36
Delta Airlines	9.11	138876301	66.3	1212.57	3.51	206.58
Ethiopian Airlines	15.49	1606971	56.1	931.00	-	1.61
Finnair	10.81	6490152	62.8	1034.69	3.01	108.33
Iberia	12.76	22530578	68.6	1161.69	5.45	233.39
Japan Air System	24.28	10613868	62.0	690.61	-	10.61
Japan Airlines	14.08	62936425	68.9	2416.82	-	251.33
Kuwait Airways	12.71	4514198	60.7	2022.41	-	27.04
Lacsa	8.72	1606873	57.2	1225.71	0.56	24.14
Ladeco	7.68	2252661	61.5	1121.02	-	24.78
LOT	8.31	3899221	66.1	1261.30	-	235.59
Lufthansa	16.87	56536239	67.9	1112.06	4.68	403.34
Meridiana	17.15	1397392	55.7	585.25	4.60	1.40
Mexicana	11.15	8751656	59.6	1036.85	3.06	19.26
Northwest Airlines	8.72	93135305	68.1	1363.53	2.86	173.82
Olympic Airways	10.24	8428539	64.4	738.05	-	8.43
PAL	8.66	13967281	68.7	1167.66	0.81	18.48
PIA	7.90	10407553	66.9	1028.67	1.25	10.41
Qantas	5.25	48345281	72.1	2081.60	1.82	393.86
Royal Air Maroc	9.91	4573009	68.1	1299.83	-	77.22
SAS	19.79	18465652	65.6	713.45	6.60	69.03
Saudi	14.10	18249970	61.8	1138.69	-	26.68
SIA	7.12	44946900	71.5	3471.42	-	183.82
TAP	16.54	7585727	69.3	1420.07	-	7.59
Thai Airways	8.44	25241586	68.1	1542.19	1.46	25.24
Tower Air	7.15	4439799	74.2	4622.82	1.42	4.44
TWA	8.34	40080542	63.5	1361.76	3.01	52.20
United Airlines	8.09	173833646	71.1	1707.54	2.79	277.98
USAir	11.06	61057928	62.2	861.88	4.63	357.55
Virgin	5.51	12243471	71.0	7454.42	0.53	153.34

-: Labour cost data not available

APPENDIX B: Data for computation of the change in alliance inter-hub passenger traffic and load factor

H_x	H_y	$Pax_{89/91}$	$Cap_{89/91}$	$LF_{89/91}$	Pax_{94}	Cap_{94}	LF_{94}
Copenhagen	Vienna	48661	86593	0.5620	72758	124326	0.5852
Vienna	Copenhagen	52001	86483	0.6013	72887	124533	0.5853
Stockholm	Vienna	22061	40132	0.5497	35476	71779	0.4942
Vienna	Stockholm	22507	39885	0.5643	39482	71883	0.5493
Geneva	Vienna	18134	51886	0.3495	29819	79664	0.3743
Zurich	Vienna	n/a	n/a	-	158702	324939	0.4884
Vienna	Geneva	19736	52499	0.3759	29665	79084	0.3751
Vienna	Zurich	157427	282421	0.5574	132168	326137	0.4053
Copenhagen	Geneva	29053	60421	0.4808	52594	119692	0.4394
Copenhagen	Zurich	84475	159700	0.5290	75780	144368	0.5249
Oslo	Zurich	10614	25720	0.4127	34153	74154	0.4606
Stockholm	Zurich	72033	135759	0.5306	65826	149881	0.4392
Stockholm	Geneva	12885	27541	0.4678	28777	56254	0.5116
Geneva	Copenhagen	28830	57851	0.4983	47441	119501	0.3970
Geneva	Stockholm	n/a	n/a	-	27131	56238	0.4824
Zurich	Copenhagen	91050	163746	0.5560	87344	170808	0.5114
Zurich	Oslo	16912	63201	0.2676	36448	74143	0.4916
Zurich	Stockholm	75377	133936	0.5628	55557	123385	0.4503
Atlanta	Zurich	43934	73031	0.6016	58700	95513	0.6146
Zurich	Atlanta	48248	73037	0.6606	59703	95015	0.6284
Cincinnati	Zurich	n/a	n/a	-	12573	29975	0.4194
Zurich	Cincinnati	n/a	n/a	-	13467	29620	0.4547
Copenhagen	New york	67586	91356	0.7398	90571	123725	0.7320
Oslo	New york	42969	61352	0.7004	84563	123142	0.6867
Stockhom	New york	47408	67347	0.7039	82887	124116	0.6678
New york	Copenhagen	65280	90292	0.7230	92477	123528	0.7486
New york	Oslo	42091	61785	0.6812	53554	74290	0.7209
New york	Stockhom	46232	65902	0.7015	51958	74082	0.7014
Boston	Amsterdam	39487	61068	0.6466	72938	92508	0.7885
Detroit	Amsterdam	n/a	n/a	-	70709	97677	0.7239
Minneapolis	Amsterdam	n/a	n/a	-	68112	81810	0.8326
Amsterdam	Boston	40091	60806	0.6593	72629	92502	0.7852
Amsterdam	Detroit	n/a	n/a	-	79211	98208	0.8066
Amsterdam	Minneapolis	n/a	n/a	-	69364	81526	0.8508
Buenos aires	Madrid	59018	77091	0.7656	97354	135662	0.7176
Madrid	Buenos aires	46215	64932	0.7117	89133	115411	0.7723
Caracas	Madrid	52081	78968	0.6595	62814	92606	0.6783
Madrid	Caracas	46956	78792	0.5959	61059	93063	0.6561
Chicago	Frankfurt	69955	93961	0.7445	139843	199028	0.7026
S.Francisco	Frankfurt	69376	89092	0.7787	87141	114086	0.7638
Washington	Frankfurt	54382	71914	0.7562	148757	193287	0.7696
Frankfurt	Chicago	72648	94702	0.7671	148496	198858	0.7467
Frankfurt	S.Francisco	67358	89098	0.7560	84091	114086	0.7371
Frankfurt	Washington	54643	71902	0.7600	141792	192665	0.7360
London	Baltimore	n/a	n/a	-	47649	76220	0.6252
London	Boston	107203	131689	0.8141	124691	159415	0.7822
London	Charlotte	n/a	n/a	-	54534	76459	0.7132
London	Los Angeles	162152	206748	0.7843	193702	265907	0.7285
London	New York	376283	511488	0.7357	457770	647898	0.7065

H_x	H_y	$Pax_{89/91}$	$Cap_{89/91}$	$LF_{89/91}$	Pax_{94}	Cap_{94}	LF_{94}
London	Philadelphia	51146	64598	0.7918	119167	158425	0.7522
London	Pittsburgh	n/a	n/a	-	27737	44890	0.6179
Baltimore	London	n/a	n/a	-	47123	75180	0.6268
Boston	London	105532	131201	0.8044	124655	157173	0.7931
Charlotte	London	n/a	n/a	-	56514	76650	0.7373
Los Angeles	London	160238	206515	0.7759	194486	264522	0.7352
New York	London	347924	511646	0.6800	429937	648842	0.6626
Philadelphia	London	44540	62992	0.7071	115005	157457	0.7304
Pittsburgh	London	99	739	0.1340	25828	44310	0.5829

Data source: *ICAO-Traffic by Flight Stage, 1989 and 1994 editions*
n/a: data not available or flight was not operated

APPENDIX C: Data accompanying Table 10.2

Year	*HPAX*	*GDP*[1]	*CAP*	*FARE*[2]	*LCOM*	*WAR*	*RECESSION*
From Copenhagen to Vienna (SAS-Austrian Airlines)							
1983	48651	95775	97476	1739	0	0	0
1984	55055	99220	101841	1756	0	0	0
1985	48997	102497	85104	1793	1	0	0
1986	47813	107533	85725	1793	1	0	0
1987	49900	109513	82262	1663	0	0	0
1988	48902	109007	86378	1554	1	0	0
1989	48661	111406	86593	1536	1	0	0
1990	48997	111637	87722	1604	1	0	1
1991	50565	113409	106717	1731	1	1	1
1992	65602	114944	121058	1764	0	0	1
From Vienna to Copenhagen (SAS-Austrian Airlines)							
1983	46091	1035532	89347	5121	0	0	0
1984	49371	1038028	92946	4715	0	0	0
1985	49206	1061752	85394	4882	1	0	0
1986	48893	1102711	86042	4884	2	0	0
1987	52447	1130831	82752	4870	1	0	0
1988	52312	1177878	87303	4887	0	0	0
1989	52001	1220095	86483	4745	0	0	0
1990	54171	1334074	87464	4667	1	0	1
1991	53695	1393478	106373	4891	1	1	1
1992	67163	1423776	121783	4818	0	0	1
From Stockholm to Vienna (SAS-Austrian Airlines)							
1983	9213	1232726	17663	1825	0	0	0
1984	10404	1282617	17954	1868	0	0	0
1985	11198	1307362	17832	1809	0	0	0
1986	12412	1337355	20393	1909	0	0	0
1987	14440	1379417	21064	1832	0	0	0
1988	15410	1410470	21714	1732	0	0	0
1989	22061	1443989	40132	1672	0	0	0
1990	28271	1463668	51932	1581	1	0	1
1991	32656	1447327	67944	1778	0	1	1
1992	33087	1426750	73043	1790	0	0	1
From Vienna to Stockholm (SAS-Austrian Airlines)							
1983	14772	1035532	26218	6767	0	0	0
1984	16119	1038028	26844	6488	0	0	0
1985	12413	1061752	18212	6457	0	0	0
1986	13367	1102711	20393	6457	0	0	0
1987	14935	1130831	20929	6443	0	0	0
1988	15336	1177878	21800	6474	0	0	0
1989	22507	1220095	39885	6285	0	0	0
1990	32237	1334074	57392	6178	0	0	1
1991	26134	1393478	66929	6471	1	1	1
1992	36627	1423776	75036	6371	0	0	1

Data sources: *International/European Marketing Data and Statistics, Euromoney Plc.; ICAO Digest of Statistics, ABC Guide*
[1]In millions of local currency, constant 1980 terms;
[2]In local currency, constant 1980 terms

Year	*HPAX*	*GDP*	*CAP*	*FARE*	*LCOM*	*WAR*	*RECESSION*
From Geneva to Vienna (Swissair-Austrian Airlines)							
1983	13361	172647	40568	743	0	0	0
1984	15399	175967	36420	751	0	0	0
1985	15781	182316	36864	735	0	0	0
1986	15316	187398	38771	799	0	0	0
1987	16976	191769	38315	780	1	0	0
1988	14031	197102	38807	766	1	0	0
1989	18134	204423	51886	745	1	0	0
1990	18158	209197	48174	731	1	0	1
1991	20944	209332	63641	769	0	1	1
1992	24324	208705	73291	773	0	0	1
From Vienna to Geneva (Swissair-Austrian Airlines)							
1983	13144	1201217	37517	3716	0	0	0
1984	14632	1276775	36433	3602	0	0	0
1985	15820	1348425	36986	3598	0	0	0
1986	16440	1422497	39041	3667	0	0	0
1987	19745	1481388	38315	3725	0	0	0
1988	16800	1566578	38807	3737	0	0	0
1989	19736	1671530	52499	3628	0	0	0
1990	19425	1801000	48114	3793	0	0	1
1991	22554	1923000	63855	3986	0	1	1
1992	22318	2036000	68044	4000	0	0	1
From Vienna to Zurich (Swissair-Austrian Airlines)							
1983	69272	1201217	126583	2879	4	0	0
1984	72814	1276775	128681	2797	2	0	0
1985	139060	1348425	261943	2787	3	0	0
1986	130674	1422497	268369	2845	2	0	0
1987	146200	1481388	275177	2885	3	0	0
1988	148744	1566578	280409	2902	4	0	0
1989	157427	1671530	282421	2818	5	0	0
1990	172237	1801000	282707	2948	4	0	1
1991	153663	1923000	307249	3152	5	1	1
1992	90124	2036000	330659	2986	3	0	1
From Copenhagen to Geneva (SAS-Swissair)							
1983	36098	95775	45418	1862	0	0	0
1984	41303	99220	62193	1861	0	0	0
1985	41389	102497	68101	1902	0	0	0
1986	33867	107533	69739	1885	1	0	0
1987	34251	109513	70173	1816	0	0	0
1988	31920	109007	73289	1694	0	0	0
1989	29053	111406	60421	1690	0	0	0
1990	37375	111637	66942	1763	1	0	1
1991	41975	113409	84327	1954	0	1	1
1992	48997	114944	108775	1907	0	0	1

Year	*HPAX*	*GDP*	*CAP*	*FARE*	*LCOM*	*WAR*	*RECESSION*
From Copenhagen to Zurich (SAS-Swissair)							
1983	47922	95775	81204	1659	4	0	0
1984	57286	99220	94095	1663	4	0	0
1985	79478	102497	141143	1697	3	0	0
1986	84298	107533	146252	1682	3	0	0
1987	85719	109513	145064	1619	4	0	0
1988	82268	109007	152639	1512	3	0	0
1989	84475	111406	159700	1510	2	0	0
1990	82270	111637	166009	1576	2	0	1
1991	77158	113409	160079	1748	2	1	1
1992	77296	114944	136205	1705	2	0	1
From Oslo to Zurich (SAS-Swissair)							
1988	9159	274613	24994	1643	0	0	0
1989	10614	279775	25720	1571	0	0	0
1990	24162	285703	45773	1598	0	0	1
1991	28333	287194	53425	1880	0	1	1
1992	32205	287271	71154	1837	0	0	1
From Stockholm to Zurich (SAS-Swissair)							
1983	8525	1232726	18010	1927	0	0	0
1984	15951	1282617	31885	1882	0	0	0
1985	48894	1307362	74233	1825	1	0	0
1986	59942	1337355	98728	1906	0	0	0
1987	65571	1379417	101656	1919	0	0	0
1988	68780	1410470	112803	1885	0	0	0
1989	72033	1443989	135759	1749	0	0	0
1990	70690	1463668	166705	1653	0	0	1
1991	23097	1447327	72847	1884	0	1	1
1992	61526	1426750	140477	1842	0	0	1
From Stockholm to Geneva (SAS-Swissair)							
1985	428	1307362	860	1971	0	0	0
1989	12885	1443989	27541	1927	0	0	0
1990	24810	1463668	55073	1785	0	0	1
1992	27871	1426750	70087	1990	0	0	1

Year	*HPAX*	*GDP*	*CAP*	*FARE*	*LCOM*	*WAR*	*RECESSION*
From Geneva to Copenhagen (SAS-Swissair)							
1983	14977	172647	28295	975	0	0	0
1984	19540	175967	35180	976	0	0	0
1985	41077	182316	67792	1048	0	0	0
1986	41576	187398	69462	1054	0	0	0
1987	44719	191769	70970	1042	0	0	0
1988	39860	197102	70913	1021	0	0	0
1989	28830	204423	57851	993	1	0	0
1990	31372	209197	66571	976	0	0	1
1991	36163	209332	76017	994	0	1	1
1992	37145	208705	69487	999	0	0	1
From Geneva to Stockholm (SAS-Swissair)							
1985	421	182316	935	1422	0	0	0
1986	69	187398	110	1428	0	0	0
1988	10179	197102	4900	1384	0	0	0
1990	22990	209197	55233	1323	0	0	1
1992	25886	208705	70025	1355	0	0	1
From Zurich to Copenhagen (SAS-Swissair)							
1983	45874	172647	74362	871	3	0	0
1984	61017	175967	87070	878	4	0	0
1985	93629	182316	141449	938	3	0	0
1986	95551	187398	146902	939	3	0	0
1987	93998	191769	145397	929	5	0	0
1988	91418	197102	155053	911	5	0	0
1989	91050	204423	163746	886	2	0	0
1990	85687	209197	167191	871	1	0	1
1991	79756	209332	105926	888	2	1	1
1992	83245	208705	174901	893	3	0	1
From Zurich to Oslo (SAS-Swissair)							
1988	11023	197102	31962	1281	0	0	0
1989	16912	204423	63201	1246	0	0	0
1990	26652	209197	45956	1225	0	0	1
1991	29679	209332	53121	1248	0	1	1
1992	34026	208705	71095	1255	0	0	1
From Zurich to Stockholm (SAS-Swissair)							
1983	10519	172647	24070	1224	0	0	0
1984	17211	175967	39135	1234	0	0	0
1985	47683	182316	73722	1321	0	0	0
1986	56742	187398	98170	1321	0	0	0
1987	63332	191769	101454	1308	0	0	0
1988	67221	197102	112212	1281	0	0	0
1989	75377	204423	133936	1246	1	0	0
1990	70228	209197	166139	1225	0	0	1
1991	22758	209332	73097	1248	0	1	1
1992	61171	208705	140879	1255	0	0	1

Year	*HPAX*	*GDP*	*CAP*	*FARE*	*LCOM*	*WAR*	*RECESSION*
From Atlanta to Zurich (Swissair-Delta Airlines)							
1987	22458	3258387	43873	738	0	0	0
1988	36793	3370807	69604	694	0	0	0
1989	43934	3446694	73031	603	0	0	0
1990	45805	3481841	75891	603	0	0	1
1991	44664	3462129	74691	682	0	1	1
1992	50751	3545802	84497	702	0	0	1
From Zurich to Atlanta (Swissair-Delta Airlines)							
1987	25522	191769	43873	4618	0	0	0
1988	40315	197102	69785	3717	0	0	0
1989	48248	204423	73037	2418	0	0	0
1990	50442	209197	76115	2304	0	0	1
1991	48424	209332	74261	2512	0	1	1
1992	53296	208705	84488	2353	0	0	1
From Copenhagen to New York (SAS-Continental)							
1983	88386	95775	112979		1	0	0
1984	109581	99220	145604	4935	1	0	0
1985	83794	102497	121403	4836	1	0	0
1986	76083	107533	114987	n/a[1]	1	0	0
1987	69574	109513	89088	4378	3	0	0
1988	61649	109007	78331	4062	3	0	0
1989	67586	111406	91356	n/a	1	0	0
1990	72008	111637	92601	4443	1	0	1
1991	60829	113409	76057	3765	1	1	1
1992	79354	114944	105399	3663	2	0	1
From Oslo to New York (SAS-Continental)							
1983	48927	264431	71635	2991	1	0	0
1984	68753	280020	100077	3379	1	0	0
1985	53325	292857	81868	3355	1	0	0
1986	46772	280566	73621	n/a	1	0	0
1987	52771	282150	70348	3259	1	0	0
1988	38190	274613	58725	3133	3	0	0
1989	42969	279775	61352	2945	1	0	0
1990	45145	285703	69788	3149	1	0	1
1992	47784	287271	64199	2756	1	0	1
From Stockholm to New York (SAS-Continental)							
1983	11063	1232726	13781	4608	0	0	0
1984	22272	1282617	28735	4267	0	0	0
1985	16178	1307362	25041	3946	1	0	0
1986	25035	1337355	36585	n/a	0	0	0
1987	23958	1379417	29344	3943	1	0	0
1988	36115	1410470	51860	3752	3	0	0
1989	47408	1443989	67347	3573	2	0	0
1990	49780	1463668	74150	3597	3	0	1
1992	48902	1426750	72494	2988	3	0	1

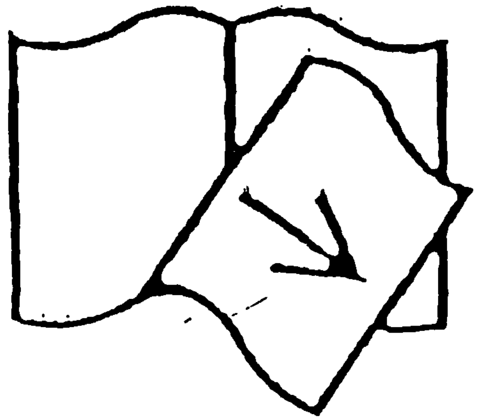
[1]Not available

Year	HPAX	GDP	CAP	FARE	LCOM	WAR	RECESSION
From New York to Copenhagen (SAS-Continental)							
1983	83473	2707215	113814	612	1	0	0
1984	107267	2884589	145360	684	1	0	0
1985	82434	3066068	119639	658	1	0	0
1986	77864	3181041	113584	n/a	2	0	0
1987	70340	3258387	84544	651	3	0	0
1988	60927	3370807	77851	630	2	0	0
1989	65280	3446694	90292	636	1	0	0
1990	72188	3481841	92170	634	2	0	1
1991	61218	3462129	75200	549	3	1	1
1992	79831	3545802	105385	555	3	0	1
From New York to Oslo (SAS-Continental)							
1983	51669	2707215	68539	654	1	0	0
1984	66636	2884589	96088	684	1	0	0
1985	51956	3066068	81409	658	1	0	0
1986	46487	3181041	74342	n/a	1	0	0
1987	52724	3258387	70124	651	2	0	0
1988	38306	3370807	57991	630	3	0	0
1989	42091	3446694	61785	601	1	0	0
1990	43940	3481841	69161	634	2	0	1
1992	50498	3545802	69703	555	2	0	1
From New York to Stockholm (SAS-Continental)							
1983	12131	2707215	15567	782	0	0	0
1984	24297	2884589	31789	737	0	0	0
1985	19178	3066068	27571	708	0	0	0
1986	26248	3181041	36312	n/a	0	0	0
1987	28051	3258387	34944	701	2	0	0
1988	37920	3370807	52841	677	4	0	0
1989	46232	3446694	65902	646	2	0	0
1990	50109	3481841	74568	584	2	0	1
1991	49061	3462129	71046	600	3	1	1
1992	48959	3545802	72689	598	3	0	1
From Boston to Amsterdam (KLM-Northwest Airlines)							
1988	16698	3370807	21868	n/a	0	0	0
1989	39487	3446694	61068	n/a	0	0	0
1990	57674	3481841	76107	n/a	0	0	1
1991	55778	3462129	70677	n/a	3	1	1
1992	57802	3545802	78196	n/a	1	0	1
From Amsterdam to Boston (KLM-Northwest Airlines)							
1988	17214	473717	21868	n/a	1	0	0
1989	40091	495893	60806	n/a	1	0	0
1990	59037	516267	75841	n/a	1	0	0
1991	56708	527946	71036	n/a	2	3	1
1992	57937	534599	77776	n/a	1	1	0

Year	*HPAX*	*GDP*	*CAP*	*FARE*	*LCOM*	*WAR*	*RECESSION*
From Buenos Aires to Madrid (Iberia-Aerolineas Argentinas)							
1983	36923	9783	64799	n/a	0	0	0
1984	38600	9962	62318	n/a	0	0	0
1985	43795	9303	80102	n/a	0	0	0
1986	71046	9984	99183	n/a	0	0	0
1987	59961	10242	92017	n/a	0	0	0
1988	32463	10049	39990	n/a	0	0	0
1989	59018	9424	77091	n/a	0	0	0
1990	83033	9430	106173	n/a	0	0	1
1991	74833	10270	121744	n/a	0	1	1
1992	103899	11159	142189	n/a	0	0	1
From Madrid to Buenos Aires (Iberia-Aerolineas Argentinas)							
1983	34998	30083	70228	212407	0	0	0
1984	40082	30524	58267	238186	0	0	0
1985	40156	31321	74063	260780	0	0	0
1986	60971	32324	88052	258638	0	0	0
1987	57941	34148	89280	239519	0	0	0
1988	15782	35910	18920	228535	0	0	0
1989	46215	37611	64932	224553	0	0	0
1990	51607	39018	70871	210503	0	0	1
1991	69187	39893	119028	227584	1	1	1
1992	92023	40169	127158	214890	0	0	1
From Caracas to Madrid (Iberia-Viasa)							
1983	31160	425837	65773	4511	1	0	0
1984	30966	420072	47632	8120	1	0	0
1985	26720	420884	40547	1049	1	0	0
1986	48896	448285	76874	2889	1	0	0
1987	16838	464341	26068	1049	1	0	0
1988	20322	491372	28196	682	1	0	0
1989	52081	449262	78968	787	0	0	0
1990	50111	478320	77610	952	1	0	1
1991	53741	524860	80670	1030	1	1	1
1992	62572	556669	93992	1112	1	0	1
From Madrid to Caracas (Iberia-Viasa)							
1983	26548	30083	65899	186667	1	0	0
1984	27690	30524	46302	222879	1	0	0
1985	25519	31321	40814	236850	1	0	0
1986	49593	32324	75810	224228	1	0	0
1987	14610	34148	25536	213151	1	0	0
1988	17621	35910	29526	203376	1	0	0
1989	46956	37611	78792	190286	1	0	0
1990	48442	39018	79238	170112	1	0	1
1991	46929	39893	79098	184283	1	1	1
1992	60547	40169	93461	174004	1	0	1

PAGES MISSING
NOT AVAILABLE

P337 P338. P339, P340



APPENDIX D: Alliance success factor computation

Data for the computation of Δ*YIELD_A*

Airline (*x*)	Partner (*y*)	*RPK_x (89/91)*[(1)]	*RPK_y (89/91)*	*REV_x (89/91)*[(2)]	*REV_y (89/91)*	*YIELD_A (89/91)*
		('000)	('000)	(Const. $000)	(Const. $000)	(US cts/RPK)
OS	SR	2331958	15390972	475217.98	2958790.31	19.38
OS	SK	2331958	12137500	475217.98	3482492.60	27.35
SK	SR	12137500	15390972	3481265.94	2958790.31	23.39
BA	US	60757570	40445013	7850663.75	4430958.37	12.14
KL	NW	24930526	50315504	3017092.93	6906034.77	13.19
SK	CO	12137500	62402310	3482492.60	5209932.56	11.66
IB	VA	21034852	2532632	3208629.67	n/a[(3)]	13.61
IB	AR	21034852	3555000	3208629.67	n/a	13.05
IB	LA	21034852	808932	3208629.67	115248.66	15.22
SR	DL	15390972	65224895	2958790.31	9113082.19	14.97
Airline (*x*)	Partner (*y*)	*RPK_x (94)*	*RPK_y (94)*	*REV_x (94)*	*REV_y (94)*	*YIELD_A (94)*
		('000)	('000)	(Const. $000)	(Const. $000)	(US cts/RPK)
OS	SR	3746915	17138000	683259.91	3074610.812	17.99
OS	SK	3746915	18138000	683259.91	2713496.377	15.52
SK	SR	18138000	17138000	2714315.92	3074610.812	16.41
BA	US	80086000	56681000	7584215.25	5659584.087	9.68
KL	NW	36807000	93549000	14902904.28	7296052.109	17.03
SK	CO	18138000	68114000	2713496.38	4320253.165	8.15
IB	VA	23265000	3244720	2166240.41	n/a	8.17
IB	AR	23265000	7751000	2166240.41	n/a	6.98
IB	LA	23265000	1724807	2166240.41	1055967.031	12.89
SR	DL	17138000	133346000	3074610.72	10917359.86	9.30
Airline (*x*)	Partner (*y*)	Δ*YIELD_A*				
		(US cts/RPK)				
OS	SR	-1.38				
OS	SK	-11.83				
SK	SR	-6.98				
BA	US	-2.45				
KL	NW	3.84				
SK	CO	-3.51				
IB	VA	-5.44				
IB	AR	-6.06				
IB	LA	-2.32				
SR	DL	-5.68				

Notes:
(1) RPK data obtained from IATA WATS and AEA-Statistical Appendices to Yearbooks
(2) Revenue data obtained from ICAO-Financial Data and airline annual reports
(3) Not available

Data for the computation of *SEAM*

Airline	Avge aircraft age[(1)] (years)	No. of aircraft[(2)]	Total capacity[(3)] (no. of seats)	Average aircraft capacity	No. of flight attendants[(4)]	No. of flight attendants/ seat
OS	6.1	32	3617	113.03	719	0.199
SR	8.0	62	10827	174.63	2824	0.261
SK	6.0	183	22335	122.05	2886	0.129
BA	8.1	245	48776	199.09	10242	0.210
KL	6.2	119	23066	193.83	5300	0.230
US	10.4	441	54360	123.27	8473	0.156
CO	11.5	305	43138	141.44	5928	0.137
NW	10.5	350	60995	174.27	8688	0.142
DL	9.3	558	94759	169.83	15949	0.168
IB	8.2	112	18692	166.89	3014	0.161
AR	11.3	45	8118	180.4	1068	0.132
VA	10.7	19	3198	168.32	398	0.124

Notes:
[(1)]Obtained from airline reports and Dempsey and Goetz (1992)
[(2]Obtained from airline reports and *ICAO-Fleet and Personnel, 1993*
[(30]Obtained from *ABC World Airways Guide, 1994*
[(4)]Obtained from *IATA WATS No. 38, 6/94*

Alliance	*AGE_A*	*T_CHECK*	*TERMINAL*	*J_ADVERT*	*S_PITCH*	*SERVICE*
OS-SR	0.526	1	1	1	0.0162	0.062
OS-SK	10.000	1	1	1	0.1108	0.070
SK-SR	0.500	1	1	1	0.0190	0.132
SK-CO	0.182	0	1	0	0.0516	0.008
SR-DL	0.769	1	1	0	0.2083	0.093
BA-US	0.435	1	1	0	0.0131	0.054
KL-NW	0.233	1	1	1	0.0511	0.087
IB-AR	0.323	0	1	0	0.0740	0.030
IB-VA	0.400	0	1	0	0.6993	0.037

Variable data for modelling airline alliance performance

H_x	H_y	Δ(HPAX)	HUB_S (Km.)	Δ(NSIZE)	NCOMP	Δ(HCAP)	Δ(YIELD_A) (US cts./RPK)	Δ(TCONV) (Min.)	SEAM	Δ(LCOM)
Copenhagen	Vienna	24097	876	142	0.5043	37733	-11.83	-5.83	-0.3290	5.3
Vienna	Copenhagen	14548	876	324	0.5043	38050	-11.83	-3.29	-0.3290	6.4
Stockholm	Vienna	31976	1286	51	0.6222	31647	-11.83	0.72	-0.3290	1.8
Vienna	Stockholm	16975	1286	85	0.6222	3199	-11.83	-1.03	-0.3290	4.7
Geneva	Vienna	11685	817	7	0.3789	27778	-1.38	21.00	4.4230	6.4
Zurich	Vienna	62913	603	-4	0.1617	154451	-1.38	-55.71	4.4230	4.1
Vienna	Zurich	-25259	603	72	0.1617	43716	-1.38	-10.78	4.4230	3.5
Copenhagen	Geneva	23541	1138	12	0.6552	59271	-6.98	3.12	5.9710	2.6
Oslo	Zurich	23539	1389	141	0.6689	48423	-6.98	-4.64	5.9710	4.5
Stockholm	Zurich	-6207	1487	215	0.8314	14122	-6.98	-0.55	5.9710	5.7
Stockholm	Geneva	15892	1682	110	0.6829	28713	-6.98	85.36	5.9710	4.6
Geneva	Copenhagen	18611	1138	167	0.6552	61650	-6.98	2.07	5.9710	1.5
Geneva	Stockholm	984	1682	129	0.6829	10686	-6.98	2.42	5.9710	7.3
Zurich	Copenhagen	-3706	950	212	0.4505	7062	-6.98	4.15	5.9710	2.6
Zurich	Oslo	19536	1389	-35	0.6890	10942	-6.98	1.01	5.9710	3.8
Zurich	Stockholm	-19820	1487	327	0.8314	-10551	-6.98	-7.07	5.9710	7.4
Atlanta	Zurich	14766	7531	255	0.9180	22482	-5.68	42.31	-0.0260	4.5
Zurich	Atlanta	11455	7531	-251	0.9180	21978	-5.68	1.64	-0.0260	2.1
Cincinnati	Zurich	12573	7600	152	0.9281	29975	-5.68	63.33	-0.0260	3.7
Zurich	Cincinnati	13467	7600	330	0.9281	29620	-5.68	62.13	-0.0260	5.9
Copenhagen	New York	22985	6199	139	0.9513	32369	-3.51	-1.08	-5.0750	5.4
Oslo	New York	41594	5913	119	0.9949	61790	-3.51	-1.79	-5.0750	6.7
Stockhom	New York	35479	6300	101	0.8359	56769	-3.51	-4.42	-5.0750	2.8
New York	Copenhagen	27197	6199	95	0.9513	33236	-3.51	-10.63	-5.0750	4.5

H_x	H_y	Δ(HPAX)	HUB_S (Km.)	Δ(NSIZE)	NCOMP	Δ(HCAP)	Δ(YIELD_A) (US cts./RPK)	Δ(TCONV) (Min.)	SEAM	Δ(LCOM)
New York	Oslo	11463	5913	56	0.9949	12505	-3.51	-14.37	-5.0750	4.7
New York	Stockholm	5726	6300	48	0.8359	8180	-3.51	-6.71	-5.0750	1.8
Boston	Amsterdam	33451	5547	427	0.8620	31440	3.84	18.64	5.4800	5.4
Detroit	Amsterdam	35983	6322	421	0.8637	50877	3.84	62.83	5.4800	5.1
Minneapolis	*Amsterdam*	*33386*	*6683*	424	0.8989	35010	3.84	71.92	5.4800	2.4
Amsterdam	Boston	32538	5547	144	0.8620	31696	3.84	67.66	5.4800	6.3
Amsterdam	Detroit	44485	6322	650	0.8637	51408	3.84	77.13	5.4800	5.7
Amsterdam	Minneapolis	34638	6683	765	0.8989	34726	3.84	60.24	5.480	4.8
Buenos aires	Madrid	38336	10085	9	0.9765	58571	-6.06	-0.86	-4.025	6.4
Madrid	buenos aires	42746	10085	17	0.9765	50479	-6.06	65.59	-4.025	5.6
Caracas	Madrid	10733	7005	55	0.7252	13638	-5.44	28.37	-4.942	6.4
Madrid	Caracas	14103	7005	7	0.7252	14271	-5.44	12.86	-4.942	7.1
London	Baltimore	47649	5861	244	0.9798	76220	-2.45	85.47	-1.539	8.6
London	Boston	21785	5254	352	0.9648	27726	-2.45	-45.02	-1.539	5.7
London	Charlotte	54534	6438	688	0.9077	76459	-2.45	70.47	-1.539	7.4
London	Los angeles	53835	8759	458	0.9468	59159	-2.45	-19.35	-1.539	5.6
London	New York	94702	5568	568	0.9023	136410	-2.45	-26.34	-1.539	2.8
London	Philadelphia	76900	5698	87	0.8629	93827	-2.45	2.96	-1.539	7.4
London	Pittsburgh	17858	5971	507	0.9103	-64310	-2.45	77.22	-1.539	5.6
Baltimore	London	47123	5861	206	0.9798	75180	-2.45	-46.74	-1.539	4.8
Boston	London	19123	5254	347	0.9648	25972	-2.45	-23.21	-1.539	6.9
Charlotte	London	56514	6438	316	0.9077	76650	-2.45	-25.94	-1.539	7.5
Los angeles	London	34248	8759	249	0.9468	58007	-2.45	-6.32	-1.539	6.7
New York	London	82013	5568	321	0.9023	137196	-2.45	-16.84	-1.539	6.1
Philadelphia	London	67536	5698	629	0.8629	94465	-2.45	-23.75	-1.539	7
Pittsburgh	London	25729	5971	361	0.9103	43571	-2.45	-34.18	-1.539	6.4

Validity tests for alliance performance models

Normality tests

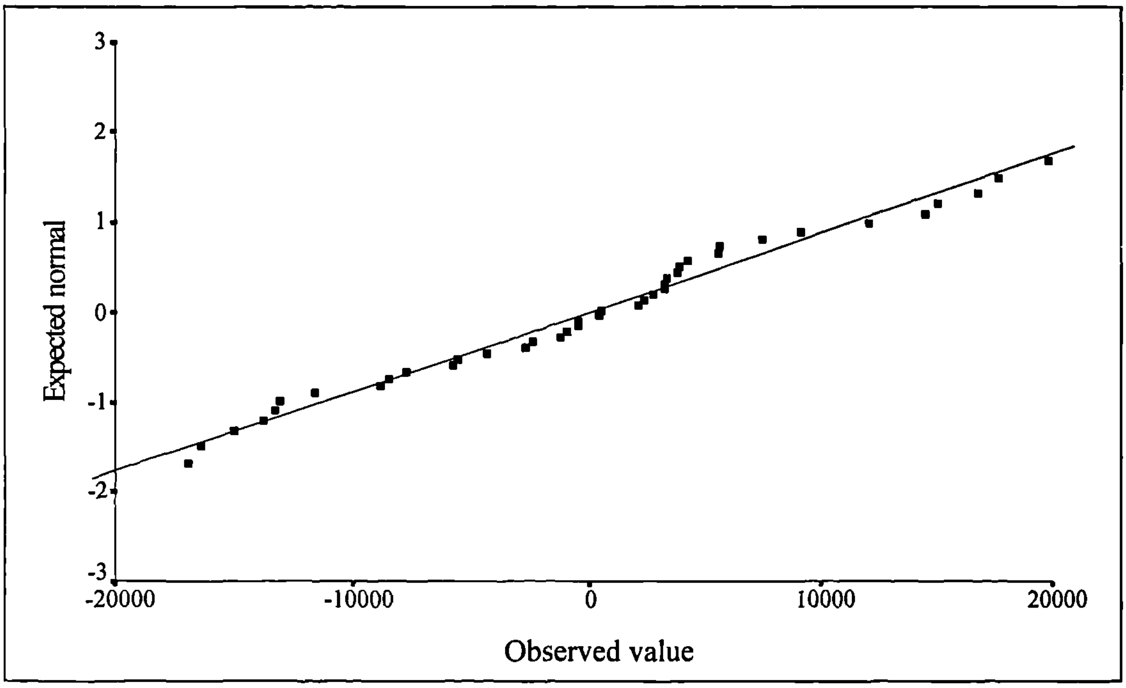


Figure D.1 Normal *Q-Q* plot of residuals for the linear model of airline alliance performance
(*K–S* = 0.0961; level of significance: 0.2000)

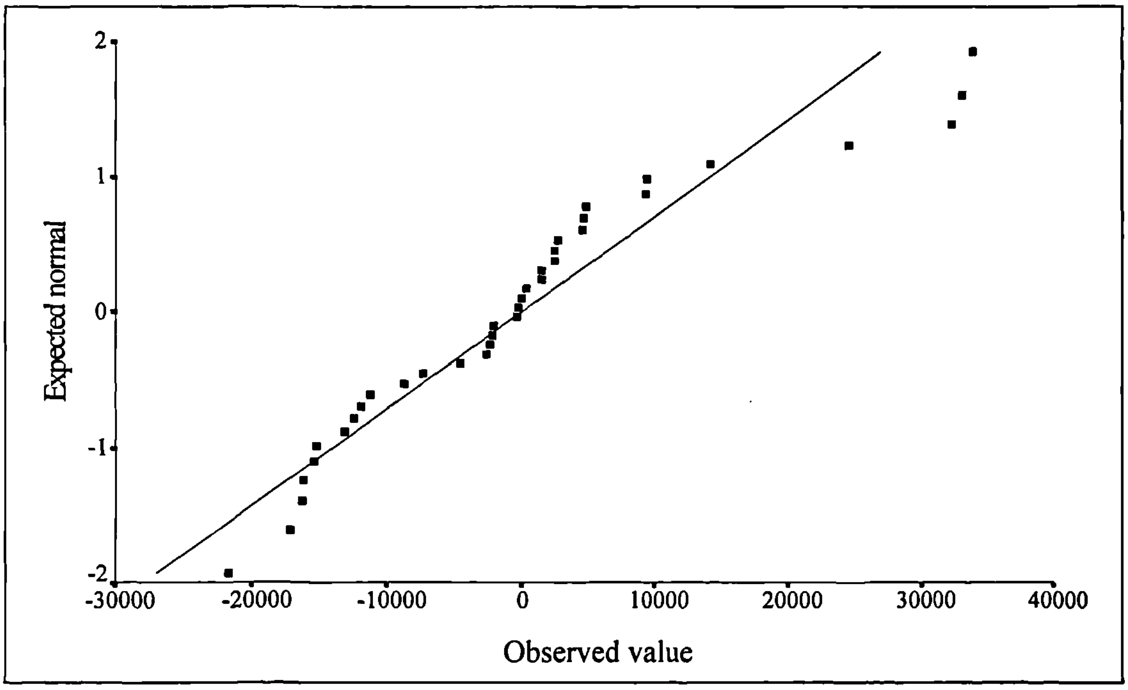


Figure D.2 Normal *Q-Q* plot of residuals for the semi-log model of airline alliance performance
(*K–S* = 0.1722; level of significance: 0.0085)

Equality of variance tests

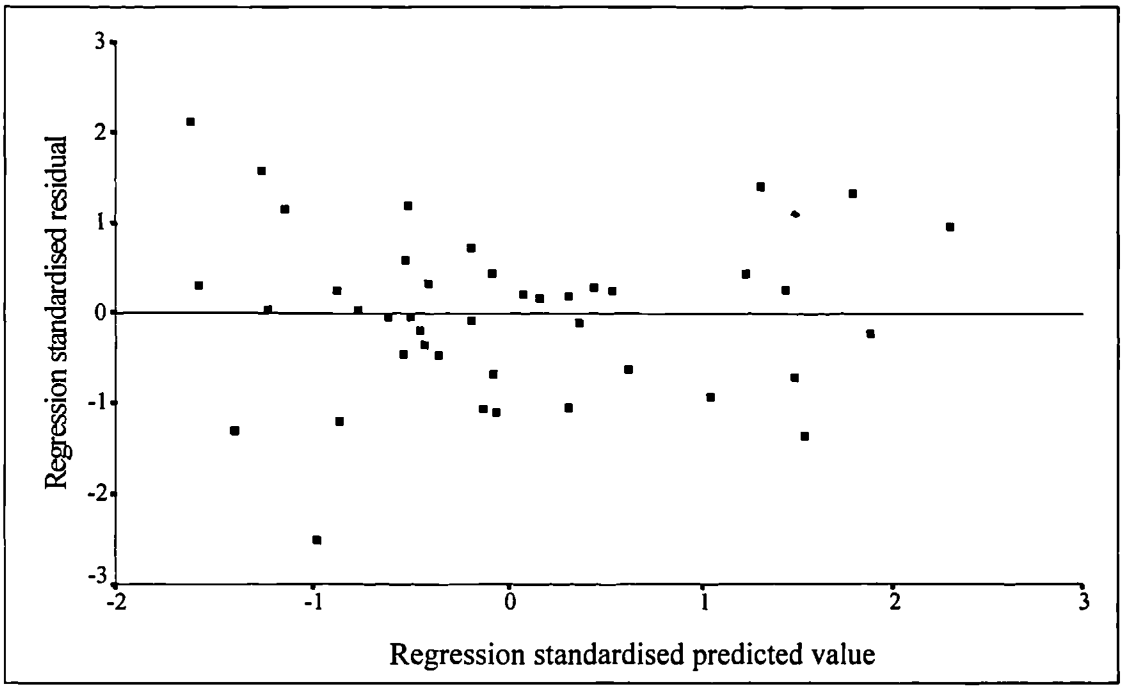


Figure D.3 Detection of heterodasticity in the linear model of airline alliance performance

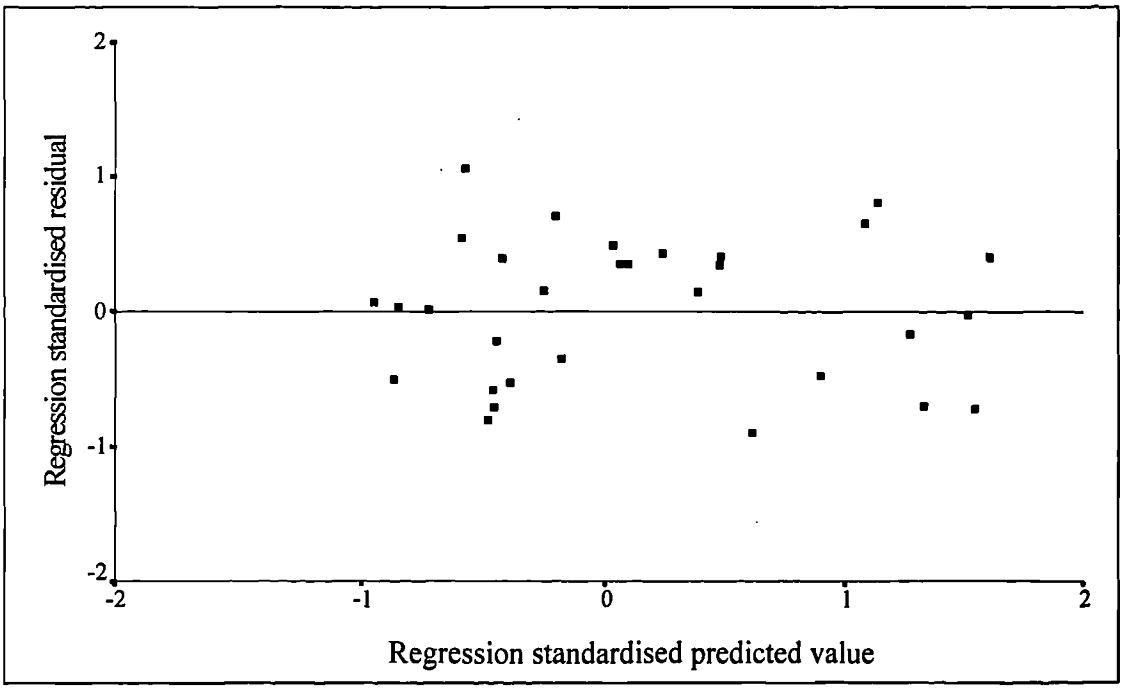


Figure D.4 Detection of heterodasticity in the semi-log model of airline alliance performance

Multicollinearity tests

	ΔHCAP	NCOMP	ΔNSIZE	S_HUB	SEAM	ΔTCONV	ΔYIELD_A
ΔHCAP							
NCOMP	-0.0869						
ΔNSIZE	-0.0015	0.2810					
S_HUB	0.1277	**0.7713**	0.1679				
SEAM	-0.1882	-0.3778	0.1612	-0.5076			
ΔTCONV	-0.1430	0.5256	0.5740	0.4595	0.0160		
ΔYIELD_A	0.2242	0.2597	0.4544	0.4165	0.1919	0.4262	
ΔLCOM	0.1258	0.3564	0.1587	0.1947	0.2543	0.2947	0.1641

Table D.1 Correlation matrix for linear alliance performance model

	ΔHCAP*	NCOMP*	ΔNSIZE*	S_HUB*	SEAM	ΔTCONV	ΔYIELD_A
ΔHCAP*							
NCOMP*	0.0041						
ΔNSIZE*	0.1633	0.2643					
S_HUB*	0.2273	**0.7713**	0.1633				
SEAM	-0.2073	-0.3283	0.2371	-0.5639			
ΔTCONV	0.0795	0.5045	0.3937	0.5247	0.0160		
ΔYIELD_A	0.3612	0.1286	0.3354	0.4543	0.1919	0.4262	
ΔLCOM	0.0468	0.3682	0.2169	0.0164	0.3415	0.3428	0.0367

Table D.2 Correlation matrix for semi-log alliance performance model
(*: *log-transformed variables*)

Variable	VIF Linear model	VIF Semi-log model
ΔHCAP	1.277	1.383
NCOMP	2.198	2.969
ΔNSIZE	1.794	1.433
S_HUB	**6.795**	**12.182**
SEAM	**3.197**	**4.408**
ΔTCONV	2.199	1.825
ΔYIELD_A	2.693	3.304
ΔLCOM	1.365	1.647

Table D.3: Variable inflation factors in linear and semi-log alliance performance models

APPENDIX E: Data accompanying Figures 11.3-11.6, 11.8

	Pre-alliance period				Post-alliance period			
H_x–H_y	*MSHARE*	*FARE*	*LCOM*	*HHI*	*MSHARE*	*FARE*	*LCOM*	*HHI*
EQA inter-hub markets								
GVA-CPH	1.0000	530.08	0	1.0000	0.4286	614.11	3	0.3794
GVA-OSL	0.4058	0.00	7	0.2216	0.6441	0.00	1	0.5415
GVA-ARN	0.5400	718.34	9	0.3202	0.7595	833.02	3	0.6023
ZRH-CPH	0.4118	472.90	10	0.1955	0.4667	548.56	3	0.3994
ZRH-OSL	0.5000	665.01	7	0.2804	0.6176	771.29	2	0.4823
ZRH-ARN	0.5161	665.01	9	0.2961	0.6180	771.29	3	0.4771
VIE-GVA	0.7105	388.08	4	0.5284	0.5000	495.47	2	0.3889
VIE-ZRH	0.7105	301.41	4	0.5284	1.0000	392.40	0	1.0000
VIE-CPH	0.9333	486.47	1	0.8756	0.8000	536.69	2	0.6608
VIE-OSL	0.4242	0.00	5	0.2355	0.5692	0.00	2	0.4400
VIE-ARN	1.0000	644.20	0	1.0000	0.7359	709.99	2	0.5646
British Airways-USAir and KLM-Northwest inter-hub markets								
AMS-BOS	0.0745	-	12	0.0804	0.2745	-	5	0.6017
AMS-DTW	0.2414	-	6	0.1736	0.3488	-	5	0.5457
AMS-MSP	0.3542	-	5	0.2118	0.6111	-	2	0.5247
LON-BOS	0.0449	971.40	14	0.0904	0.0915	794.13	10	0.1447
LON-CLT	0.4505	1829.67	4	0.2906	0.3750	1507.50	3	0.2813
LON-LAX	0.0450	1549.57	31	0.0539	0.0749	2189.92	18	0.0675
LON-JFK	0.1454	1000.13	26	0.0649	0.1550	1456.36	17	0.1076
LON-PHL	0.0654	1156.34	14	0.0764	0.0574	1453.66	11	0.1298
LON-PIT	0.2541	1307.17	10	0.1384	0.1963	1613.84	6	0.1758

Key
MSHARE: market share
FARE: C or Y fare in constant 1990 $US
LCOM: Number of competing services
HHI: Herfindahl-Hirshman concentration index

APPENDIX F: Data used in alliance market share models

Sample of EQA O-D markets originating from Copenhagen

Destination	$\Delta CTIME_A$	$\Delta FREQ_A$	$\Delta LCOM_F$	$\Delta\overline{CTIME}_C$	$\Delta\overline{QUALITY}_C$	ΔHHI	$\Delta MSHARE_A$
Abidjan	-50.00	0	2	4.83	0.0667	-0.0834	-0.0238
Accra	-11.67	0	2	63.96	0.1667	-0.0529	-0.0606
Algiers	5.00	-1	-12	-176.25	-0.2500	0.7200	0.8000
Bangkok	47.62	3	46	15.66	-0.0432	-0.0081	-0.0491
Barcelona	-45.39	-9	-53	7.78	0.3190	0.0548	0.0430
Basle	-33.33	-7	-2	-44.32	1.0000	-0.0219	-0.0478
Bombay	-37.68	-3	-14	-4.84	0.6552	0.1377	0.0161
B. Aires	15.00	-5	6	-57.92	0.2166	0.0107	0.0091
Cairo	1.12	-3	17	16.51	0.1036	-0.0098	-0.0763
Dakar	-55.00	0	-1	-28.95	0.4697	0.0104	0.0154
D.E.Salaam	-35.00	1	-2	5.32	0.4500	0.0341	0.0879
Douala	20.00	-1	-2	-32.50	1.0000	0.1111	0.0000
Dubai	35.00	0	11	3.80	0.1206	0.0238	-0.0144
H.Kong	411.94	5	26	10.63	0.0634	0.0051	0.0294
Jeddah	-100.00	0	-11	-16.42	0.5364	0.0382	0.0355
J'Burg	80.00	-2	-13	24.91	0.4743	0.0208	-0.0104
Karachi	80.00	0	3	-46.69	0.2727	0.0329	-0.0369
Kinshasa	-20.00	-1	1	52.07	-0.1786	0.0247	-0.1111
Lagos	-8.33	1	-6	41.23	0.3333	0.0667	0.1407
Lisbon	34.44	-2	0	-8.94	0.2307	0.0092	-0.0289
Madrid	21.25	14	-59	16.15	0.8188	0.1246	0.2415
Malaga	-40.00	-3	-41	-94.69	0.6042	0.5607	0.1279
Malta	3.61	3	-1	12.37	0.7252	0.0922	0.0933
Manila	55.00	0	2	9.96	0.1329	0.0251	-0.0024
Milan	-26.00	8	-46	-1.37	0.5616	0.1996	0.2935
Nairobi	70.00	0	-19	33.26	0.0467	0.0265	0.0388
Rio	27.50	-4	-19	-46.97	0.4210	0.0419	-0.0412
Rome	17.50	14	-14	12.78	0.4071	0.0577	0.1428
Salzburg	-127.50	13	-11	-35.90	0.7600	0.1590	0.4615
S. Paulo	-2.50	-1	-9	-60.98	0.3095	0.0361	0.0256
Singapore	32.46	5	-8	-48.20	0.4226	0.0466	0.0873
Tehran	-15.00	0	9	-131.21	0.1000	-0.0755	-0.1000
Tel Aviv	12.66	3	-18	-22.06	0.5714	0.1045	0.1624

Sample of EQA O-D markets originating from Vienna

Destination	$\Delta CTIME_A$	$\Delta FREQ_A$	$\Delta LCOM_F$	$\Delta\overline{CTIME}_C$	$\Delta\overline{QUALITY}_C$	ΔHHI	$\Delta MSHARE_A$
Abidjan	72.50	0	-10	89.72	0.4167	0.3980	0.3571
Abu Dhabi	24.00	2	-14	38.48	0.2083	0.0944	0.1083
Accra	-5.00	0	2	-148.00	-0.8000	-0.1701	-0.1250
Amman	-145.00	0	-8	-169.64	0.1538	0.0617	0.1524
Amsterdam	37.50	8	-60	-98.04	0.3148	0.4454	0.3310
Athens	-26.25	-1	-2	54.98	0.0000	0.0117	0.0022
Atlanta	-20.00	0	12	10.06	-0.0518	-0.0157	-0.0252
Bangkok	-29.16	4	67	0.97	-0.2085	-0.0131	-0.0464
Barcelona	20.11	-6	-21	-81.76	0.3333	0.1598	0.1021
Beijing	30.96	4	21	-23.45	-0.1929	-0.0664	0.0200
Bergen	-43.04	10	0	0.00	0.0000	0.0000	0.0000
Bombay	5.00	-3	-9	12.64	-0.1134	0.0600	-0.0314
Brazzaville	-5.00	0	0	-3.00	0.5000	0.0000	0.0000
Brussels	110.00	12	33	28.98	0.1128	-0.0098	0.0714
Bucharest	0.00	2	11	176.98	0.0000	-0.2108	-0.2917
Budapest	0.00	25	29	0.00	0.0000	-0.0800	-0.2000
B. Aires	60.00	0	-4	4.17	-0.2831	0.0390	0.0118
Cairo	93.04	0	2	-37.83	-0.1566	0.0069	-0.0072
Casablanca	10.00	0	-3	5.84	0.2500	0.1686	0.1714
Chicago	-100.42	5	34	-0.99	-0.1157	-0.0227	0.0052
Dakar	65.00	0	-5	-65.35	0.4500	0.0995	0.1190
Damascus	-69.00	-2	-4	-15.41	-0.2625	-0.0301	-0.0421
D. E. Salaam	-130.00	1	4	-10.90	-0.2917	-0.0600	0.0000
Dharan	0.00	0	-16	-175.47	0.2632	0.2398	0.3048
Dubai	56.00	2	11	30.91	-0.3181	0.0068	0.0245
Dusseldorf	0.00	5	-24	15.47	0.2500	0.0309	0.0793
Frankfurt	0.00	-6	-49	-100.93	0.1214	0.2028	0.2216
Genoa	11.74	20	-1	-225.00	-0.5000	0.2449	0.1429
Gothenburg	10.00	24	11	66.36	1.0000	-0.3732	-0.2245
Graz	0.00	18	-12	0.00	-1.0000	0.4800	0.6000
Helsinki	-48.61	8	66	0.51	-0.2821	-0.4474	-0.4448
H. Kong	28.61	5	66	-14.91	-0.3674	-0.0197	0.0037
Izmir	0.00	2	15	43.42	1.0000	-0.7346	-0.8333
Jeddah	27.50	-3	-8	-38.68	0.0311	0.0105	-0.0590
J'Burg	-133.33	3	0	-44.14	-0.1363	-0.0116	0.0705
Jonkoping	-56.33	10	0	0.00	0.0000	0.0000	0.0000
Karachi	-80.00	0	-4	40.96	-0.1116	0.0234	0.0210
Kinshasa	-25.00	0	1	33.58	-0.3571	-0.0336	-0.0278
Klagenfurt	0.00	19	-18	0.00	-1.0000	0.3750	0.7500
Lagos	-15.00	1	1	-58.08	0.1875	-0.0113	0.0350
Larnaca	-46.25	0	-11	59.34	0.2812	0.0500	0.0759
Linz	56.55	13	-1	0.00	-1.0000	0.2449	0.1429
Lisbon	40.00	-4	9	11.06	0.1654	-0.0628	-0.1306
London	-40.00	2	24	33.69	0.0071	0.0201	-0.0076
Madrid	26.74	1	2	15.88	0.1631	-0.0037	0.0042

Sample of EQA O-D markets originating from Vienna (cont'd)

Destination	$\Delta CTIME_A$	$\Delta FREQ_A$	$\Delta LCOM_F$	$\Delta\overline{CTIME}_C$	$\Delta\overline{QUALITY}_C$	ΔHHI	$\Delta MSHARE_A$
Malaga	0.00	1	-14	-7.11	0.4375	0.1466	0.2026
Malmo	67.16	13	0	0.00	0.0000	0.0000	0.0000
Malta	38.33	5	-9	-100.52	0.1364	0.4375	0.6667
Manila	-92.50	0	21	15.96	-0.2721	-0.0202	-0.0159
Milan	40.00	7	0	8.53	0.0185	0.0141	0.1356
Moscow	31.08	8	-2	-25.32	0.3056	0.1627	0.2039
Munich	0.00	-1	38	0.00	0.0000	-0.1623	-0.3154
Nairobi	-133.00	2	-22	-29.05	-0.1228	0.0594	0.0986
N. York	-21.84	-11	-2	60.89	0.0381	-0.0062	-0.0517
Nice	-96.73	-15	-26	-69.19	-0.5000	0.7655	0.5909
Norrokoping	-29.60	12	0	0.00	0.0000	0.0000	0.0000
P. D. Mall	-40.00	0	2	-19.72	0.1500	-0.0158	-0.0434
Paris	-118.42	-11	-63	-31.90	0.3659	0.3057	0.2734
Prague	0.00	15	10	0.00	0.0000	-0.0605	-0.0893
R. D. Janerio	66.82	-4	-11	-48.30	-0.3205	-0.0023	-0.0666
Riyadh	-11.50	-1	-11	-12.89	-0.6000	0.2262	0.2699
Rome	0.00	0	3	103.50	0.0000	-0.0467	-0.0882
S. Paulo	55.91	-3	-5	-40.91	-0.1244	0.0241	-0.0570
Singapore	16.54	5	10	44.65	-0.0324	0.0159	0.0361
Sofia	0.00	2	3	-28.03	0.2500	0.0189	0.0167
Stuttgart	0.00	6	-41	-81.45	0.2328	0.3936	0.3256
Tehran	-62.50	1	9	65.72	0.2500	-0.0669	-0.1460
Tel Aviv	124.52	4	-12	193.24	0.2692	0.1172	0.2222
Thessaloniki	-84.00	-3	0	58.89	0.0000	-0.0254	-0.0888
Tokyo	-45.32	7	46	-24.18	-0.3373	0.0030	0.0252
Toronto	10.00	0	69	18.99	-0.3810	-0.0902	-0.1277
Tunis	-8.33	-1	-6	-69.48	0.3750	0.1770	0.0833
Venice	0.00	9	-14	-72.50	-0.7500	0.6593	0.7368
Warsaw	0.00	3	3	0.00	0.0000	0.0000	0.0000
Zagreb	0.00	3	4	0.00	0.0000	-0.0526	-0.1282

Sample of EQA O-D markets originating from Zurich

Destination	$\Delta CTIME_A$	$\Delta FREQ_A$	$\Delta LCOM_F$	$\Delta \overline{CTIME}_C$	$\Delta \overline{QUALITY}_C$	ΔHHI	$\Delta MSHARE_A$
Bangkok	-17.07	4	36	16.42	0.1146	0.0024	-0.0006
Beijing	4.64	3	16	0.25	-0.0410	-0.0075	-0.0155
Bucharest	-10.71	7	-2	-76.67	1.0000	0.1490	0.2333
Budapest	-10.02	22	-11	-6.49	0.2516	0.2636	0.3230
Cairo	12.00	2	-6	-18.80	0.1744	0.0289	0.0532
Damascus	85.50	1	3	23.77	0.1941	-0.0053	0.0019
Dharan	35.00	0	-3	63.34	0.5000	0.3929	0.0222
Gothenburg	19.77	18	3	23.37	0.6723	0.0934	0.1259
Helsinki	-22.17	-1	57	11.55	-0.1191	0.3433	-0.2223
Istanbul	1.05	4	-36	-53.40	0.6379	0.1079	0.2497
Izmir	9.17	3	2	17.90	0.5714	0.0671	0.0962
Jonkoping	-2.37	0	-7	-142.86	0.0000	0.3725	0.2692
Kristiansand	-16.40	-1	-2	-60.00	0.0000	0.2187	0.1250
Larnaca	40.00	0	-5	26.08	0.5100	0.0353	0.0433
Malmo	-17.04	1	-7	-48.42	1.0000	-0.0209	-0.0240
Moscow	1.91	9	12	15.46	0.2812	0.4519	0.0567
Norrokoping	18.21	7	-1	-50.00	0.0000	0.1244	0.0667
Riyadh	-0.50	-1	-8	57.06	0.5333	0.0344	0.0833
Seattle	-20.00	1	-15	-6.85	0.3859	0.0617	0.0616
Singapore	-22.74	5	0	13.90	0.5068	0.0247	0.0511
Sofia	25.00	5	8	-29.95	0.7000	0.1712	0.1882
Stavanger	-13.96	-3	7	-30.36	1.0000	-0.1896	-0.1742
Tehran	15.00	1	13	49.41	0.2647	-0.1228	-0.1833
Thessaloniki	14.21	8	-40	46.45	0.5750	0.8823	0.5411
Tokyo	-23.01	8	48	16.32	-0.0188	-0.5968	0.0220
Turku	-55.00	10	5	116.36	-1.0000	-0.2375	0.2717
Vasteras	-3.53	0	0	0.00	0.0000	0.0000	0.0000
Vaxjo	1.67	1	0	0.00	0.0000	0.0000	0.0000
Warsaw	0.00	4	-2	-3.79	-0.2667	0.0629	0.1185

Sample of KLM-Northwest O-D markets originating from Amsterdam

Destinations	$\Delta CTIME_A$	$\Delta FREQ_A$	$\Delta LCOM_F$	$\Delta\overline{CTIME}_C$	$\Delta QUAL_A$	$\Delta\overline{QUALITY}_C$	ΔHHI	$\Delta MSHARE_A$
Atlanta	15.16	5	-10	-35.68	1	-0.2991	0.1106	0.1502
Chicago	32.73	8	-14	-29.82	1	-0.0310	0.0320	0.0962
Cleveland	4.00	0	-23	-32.25	1	0.0257	0.0609	0.0694
Columbus	-5.00	0	0	22.10	1	-0.3000	-0.0164	0.0000
Dallas	-121.00	1	-11	-24.58	1	0.0681	0.0211	0.0325
G. Rapids	-20.00	0	0	106.00	1	0.0000	0.0000	0.0000
Hartford	40.00	0	-6	-27.65	1	0.7000	0.0823	0.0740
Indianapolis	-3.50	7	0	38.52	1	0.0000	0.0117	0.1356
Kansas City	-6.87	6	-7	-39.17	0	-0.1667	0.0287	-0.3911
Las Vegas	10.00	0	-1	-57.53	0	-0.2348	0.0241	0.0056
Manchester	-650	0	0	0.00	0	0.0000	0.0000	0.0000
Memphis	-73.89	-20	12	74.37	0	-0.6316	-0.2209	-0.4979
Miami	-350	0	-19	-46.37	0	0.3681	0.0313	0.0257
Milwaukee	-6.75	-6	7	28.39	1	-0.0907	-0.0839	-0.1832
New Orleans	-111.00	0	-7	-37.33	1	0.1143	0.0354	0.0371
Omaha	-40.62	5	1	-38.00	1	0.0000	-0.0534	0.2000
O. County	-115.00	4	8	19.63	0	0.1250	0.2072	0.0316
Orlando	9.72	8	-19	18.17	1	-0.2907	0.1084	0.2214
Philadelphia	145	0	-31	-48.38	1	0.3841	0.1020	0.1121
Portland-Me.	30	0	0	0.00	1	0.0000	0.0000	0.0000
Portland-Or.	-8.75	5	-28	-9.74	1	0.2771	0.1608	0.2575
S. L. City	45.00	1	-5	-77.47	1	-0.3667	0.0456	0.0438
San Diego	-114.37	1	-1	-10.99	0	-0.1551	0.0240	0.0200
S. Francisco	-28.50	3	-17	-26.07	1	0.2287	0.0201	-0.7413
Seattle	6.68	-2	-22	-34.56	1	0.2701	0.0492	0.0310

Sample of KLM-Northwest O-D markets originating from Boston

Destinations	$\Delta CTIME_A$	$\Delta FREQ_A$	$\Delta LCOM_F$	$\Delta \overline{CTIME}_C$	$\Delta QUAL_A$	$\Delta \overline{QUALITY}_C$	ΔHHI	$\Delta MSHARE_A$
Abu Dhabi	130.00	0	1	-23.60	0.0000	0.3877	0.0798	-0.0036
Accra	50.00	0	-5	-38.10	0.0000	0.3750	0.0819	0.2273
Antwerp	95.00	-5	6	60.00	1.0000	1.0000	0.5030	-0.4615
Athens	-30.00	3	-1	-31.00	0.0000	0.5000	-0.0811	0.0362
Bahrain	55.00	5	2	63.20	0.0000	0.2074	0.0354	0.1640
Barcelona	205.00	0	-1	10.60	0.0000	0.0144	-0.1224	0.0023
Bremen	-105.00	0	-15	-30.40	0.0000	0.5185	0.1038	0.1625
Budapest	-105.00	0	15	61.60	0.0000	0.0874	0.0390	-0.0233
Conakry	55.00	1	1	330.00	0.0000	1.0000	-0.3750	-0.2500
Dharan	15.00	0	6	362.80	0.0000	1.0000	-0.3984	-0.8125
Dubai	60.00	2	-9	-66.30	0.0000	-0.0027	0.1115	0.0982
Dusseldorf	-105.00	0	8	30.10	1.0000	0.1755	-0.0132	-0.0173
Freetown	45.00	1	0	0.00	0.0000	0.0000	0.0000	0.0000
Geneva	-105.00	0	-9	-2.40	1.0000	0.3750	-0.0176	0.0143
Gothenburg	-110.00	3	-23	52.00	1.0000	0.5122	0.1811	0.1911
Hamburg	-105.00	0	-25	4.10	1.0000	0.4545	0.0452	0.0763
Kano	50.00	0	-4	-175.00	0.0000	-0.5000	0.6667	0.6667
Karachi	-110.00	1	-18	-330.60	0.0000	-0.7778	0.7700	0.9000
Lagos	85.00	0	-10	-31.10	0.0000	0.6000	-0.0014	0.0595
Lome	-95.00	0	2	302.50	0.0000	1.0000	-0.5000	-0.5000
Malmo	-385.00	1	-7	-130.00	0.0000	0.0000	0.4970	0.5385
Munich	-140.00	0	1	-52.40	0.0000	0.2333	-0.0408	-0.0015
Muscat	-240.00	2	4	33.70	1.0000	-0.0222	-0.3533	0.0220
Nairobi	-110.00	1	8	201.10	0.0000	0.2057	0.4970	0.0167
Newcastle	-130.00	1	8	-57.40	0.0000	0.5625	-0.0349	-0.0469
Porto	-115.00	2	-7	-145.00	0.0000	-1.0000	0.4861	0.5833
Prague	-85.00	2	-7	-42.20	0.0000	0.4280	0.0195	0.0556
Stavanger	-65.00	0	-21	-163.10	1.0000	-0.3333	0.6250	0.7500
Stockholm	-95.00	0	-1	-4.80	1.0000	-0.0463	0.0195	0.0011
Tel Aviv	-90.00	-2	-3	-75.70	0.0000	0.3023	-0.0058	-0.0408
Toulouse	185.00	-2	12	26.80	0.0000	0.7368	-0.0387	-0.2803
Tunis	-75.00	0	-6	-105.00	0.0000	0.5560	0.1481	0.2182
Zurich	-120.00	0	-14	-14.40	1.0000	0.1270	-0.0065	0.0250

Sample of KLM-Northwest O-D markets originating from Minneapolis

Destinations	$\Delta CTIME_A$	$\Delta FREQ_A$	$\Delta LCOM_F$	$\Delta \overline{CTIME}_C$	$\Delta QUAL_A$	$\Delta \overline{QUALITY}_C$	ΔHHI	$\Delta MSHARE_A$
Bahrain	110.00	-5	0	137.33	0	0.0000	-0.1806	-0.4167
Bangkok	-26.00	4	-22	-74.48	0	0.4318	0.3496	0.4062
Bremen	775.00	3	-7	-215.00	0	0.0000	0.4628	0.6364
Brussels	-61.60	-2	-35	-33.49	0	0.6250	0.1568	0.1244
Cairo	150.00	-1	-11	-213.00	0	0.7857	0.2470	0.3082
Delhi	-75.00	0	-3	-257.00	0	0.0000	0.3750	0.7500
Dusseldorf	6.25	5	-5	-107.08	0	0.5833	0.1333	0.3333
Eindhoven	55.00	0	0	0.00	1	0.0000	0.0000	0.0000
Geneva	35.00	4	-13	-82.83	1	0.4333	0.0925	0.2214
Gothenburg	-235.00	5	-30	-190.47	0	0.0000	0.8145	0.9375
Jakarta	70.00	5	0	0.00	0	0.0000	0.0000	0.0000
Lagos	-60.00	0	-7	-335.00	0	0.0000	0.2187	0.8750
Luxembourg	-215.00	7	-7	-205.00	1	0.0000	0.2187	0.8750
Milan	-120.00	11	11	-72.91	0	0.3000	-0.0421	0.1636
Munich	71.00	4	-8	-38.18	1	0.3182	0.0160	0.0990
Nice	10.00	4	1	43.00	0	0.0000	-0.0556	0.1667
Nuremberg	-260.00	6	-7	-230.00	1	1.0000	0.2187	0.8750
Oslo	-75.00	0	-14	90.34	1	-0.0334	0.0636	0.0601
Prague	26.25	6	-13	-162.20	0	0.0000	0.4274	0.6824
Singapore	-20.00	4	-6	-55.08	0	0.4167	0.2408	0.3385
Stockholm	15.00	4	-7	-7.17	1	-0.0995	0.0258	0.0976
Stuttgart	35.00	4	-13	-159.38	1	-0.4615	0.6328	0.8125
Vienna	167.50	11	-8	-37.25	0	0.3810	0.1772	0.3935
Zurich	-18.00	5	1	-61.14	0	0.1335	-0.0139	0.0935

Sample of British Airways-USAir O-D markets originating from London

Destinations	$\Delta CTIME_A$	$\Delta FREQ_A$	$\Delta LCOM_F$	$\Delta \overline{CTIME}_C$	$\Delta QUAL_A$	$\Delta \overline{QUALITY}_C$	ΔHHI	$\Delta MSHARE_A$
Altoona	-5.00	1	0	0.00	1	0.0000	0.0000	0.0000
Binghamton	-70.00	0	-27	-120.20	1	-0.5000	0.7993	0.7941
Bradford	-200.00	1	0	0.00	1	0.0000	0.0000	0.0000
Charleston	-103.69	-6	-59	-184.75	0	-0.7288	0.8943	0.8194
Charlottesville	47.61	-6	0	0.00	1	0.0000	0.0000	0.0000
Clarksburg	-57.50	6	0	0.00	1	0.0000	0.0000	0.0000
Dubois	-95.00	1	0	0.00	1	0.0000	0.0000	0.0000
Elmira	-89.48	-6	0	0.00	0	0.0000	0.0000	0.0000
Erie	-155.50	7	0	0.00	0	0.0000	0.0000	0.0000
Florence	-91.00	0	0	0.00	1	0.0000	0.0000	0.0000
Franklin	-155.00	0	0	0.00	1	0.0000	0.0000	0.0000
Gainsville	-70.08	-6	-7	2.50	1	0.1667	0.0959	-0.0491
Hagerstown	-15.00	0	0	0.00	1	0.0000	0.0000	0.0000
Hickory	-61.00	0	0	0.00	1	0.0000	0.0000	0.0000
Hilton	-46.00	0	0	0.00	1	0.0000	0.0000	0.0000
Huntingdon	-210.00	1	-6	-55.00	0	-1.0000	0.5000	0.5000
Huntsville	-36.00	0	-20	-28.67	0	0.2439	0.1068	0.1042
Jacksonville	-61.00	1	0	0.00	1	0.0000	0.0000	0.0000
Jamestown	-105.00	1	0	0.00	0	0.0000	0.0000	0.0000
Johnstown	25.00	1	0	0.00	0	0.0000	0.0000	0.0000
Kingston	-46.00	0	0	0.00	1	0.0000	0.0000	0.0000
Lancaster	-44.21	14	0	0.00	1	0.0000	0.0000	0.0000
Lynchburg	76.08	-6	0	0.00	1	0.0000	0.0000	0.0000
Parkesburg	-5.00	1	0	0.00	1	0.0000	0.0000	0.0000
Reading	-190.00	1	0	0.00	1	0.0000	0.0000	0.0000
R. Mountain	34.77	6	0	0.00	1	0.0000	0.0000	0.0000
Savannah	-78.00	-7	-43	-70.52	0	0.1930	0.2208	0.1361
S. College	-155.77	-6	0	0.00	1	0.0000	0.0000	0.0000
Williamsport	-151.84	14	0	0.00	1	0.0000	0.0000	0.0000
Winston	-16.00	0	0	0.00	1	0.0000	0.0000	0.0000
Worcester	-46.50	8	0	0.00	1	0.0000	0.0000	0.0000
Youngstown	-95.00	1	-7	-260.00	1	-0.5000	0.4970	0.5385

Sample of British Airways-USAir O-D markets originating from Philadelphia

Destinations	$\Delta CTIME_A$	$\Delta FREQ_A$	$\Delta LCOM_F$	$\Delta \overline{CTIME_C}$	$\Delta QUAL_A$	$\Delta \overline{QUALITY}_C$	ΔHHI	$\Delta MSHARE_A$
Aberdeen	-123.18	-3	0	0.00	1	0.0000	0.0000	0.0000
Amman	160.00	1	0	0.00	1	0.0000	0.0000	0.0000
Amsterdam	-87.31	-6	17	4.97	1	0.0641	-0.0498	-0.1276
Bahrain	90.00	3	-2	-360.00	1	-1.0000	0.4444	0.3333
Basle	-75.71	0	-2	-25.00	1	0.0000	0.0139	0.0833
Belfast	75.00	6	0	0.00	1	0.0000	0.0000	0.0000
Berlin	-65.00	7	-52	-155.20	1	-0.1787	0.0307	0.1327
Bilbao	110.00	0	-12	-190.83	1	-0.7083	0.4654	0.6316
Cologne	-220.00	7	0	-105.54	1	-0.2500	-0.6165	0.1815
Copenhagen	52.50	0	-7	2.46	1	-0.0713	0.0383	0.0419
Dubai	45.00	6	-3	-229.40	1	0.0000	0.2339	0.5571
Dusseldorf	-121.87	1	10	96.22	1	-0.3871	-0.0797	-0.0449
Edindurgh	-10.00	0	7	115.00	1	0.5000	-0.5000	-0.5000
Frankfurt	192.50	-7	16	-35.35	1	-0.0308	-0.0471	-0.1250
Geneva	7.50	7	-23	-12.06	1	-0.1009	0.1507	0.2813
Glasgow	-25.22	11	-7	55.50	1	-0.5000	0.2842	0.3052
Gothenburg	10.00	0	-13	-148.46	1	-0.7308	0.6650	0.6500
Hamburg	-140.56	2	17	-75.76	1	-0.1722	-0.0630	-0.0333
Helsinki	110.00	0	-13	-109.07	1	0.0867	0.1311	0.1496
Jersey	45.00	7	0	0.00	1	0.0000	0.0000	0.0000
Kuwait	328.33	2	-5	-17.37	1	-0.1667	0.2099	0.3056
London	0.00	0	-27	-116.70	1	0.1159	0.0403	0.0571
Lyon	120.00	0	-21	-106.02	1	-0.5238	0.7908	0.7500
Madrid	-45.00	7	-25	-16.28	1	-0.2157	0.0790	0.2000
Malaga	-127.00	5	-7	-202.86	1	-0.5000	0.5391	0.4375
Manchester	-53.82	12	-26	-138.41	1	-0.6346	0.7971	0.7879
Milan	47.50	7	16	40.93	1	-0.4167	0.0841	-0.0151
Munich	56.50	14	7	48.43	1	-0.3571	0.0237	0.1291
Nairobi	-42.50	-1	-3	-251.67	1	-1.0000	0.6111	0.5000
Newcastle	-81.43	0	0	0.00	1	0.0000	0.0000	0.0000
Nice	-125.00	0	-23	-64.22	1	0.3125	0.2294	0.2580
Paris	22.50	14	-36	-5.35	1	0.0000	0.2732	0.3833
Pisa	60.00	0	0	0.00	1	0.0000	0.0000	0.0000
Prague	110.00	0	-15	-116.17	1	-0.1296	0.1902	0.1625
Rome	-130.00	7	-8	-46.33	1	0.0656	0.0425	0.1554
Stockholm	-183.47	7	12	27.16	1	-0.2875	-0.0311	0.0593
Vienna	-265.50	0	15	10.95	1	-0.2243	-0.0671	-0.1122
Zurich	10.00	7	-9	-40.69	1	-0.0321	0.0348	0.1343

Appendix G: Evidence of relationship between alliance market share and market concentration

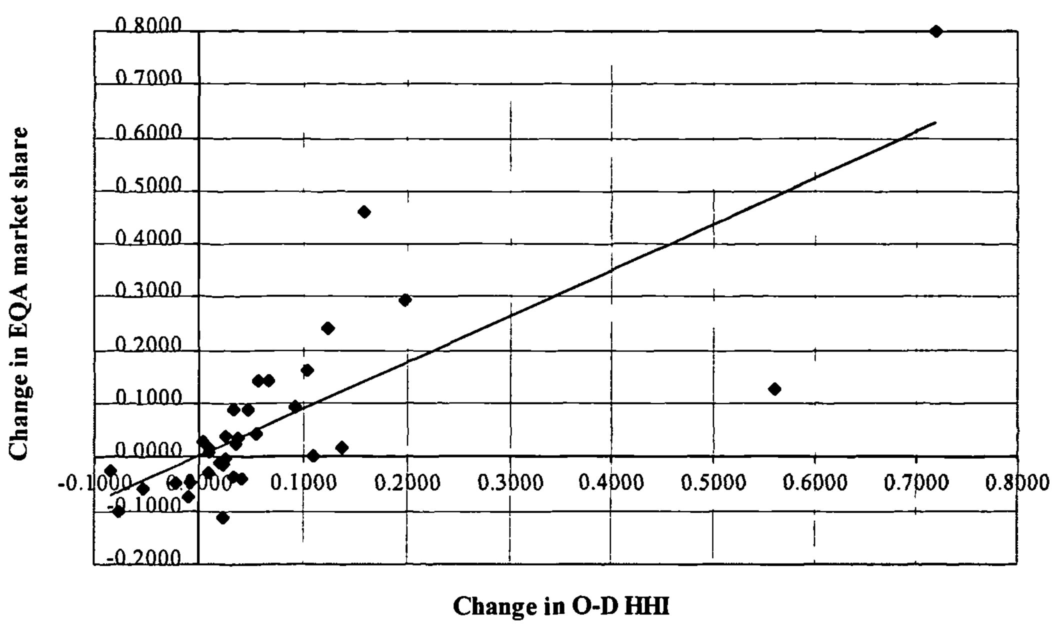


Figure G.1 Variation of $\Delta MSHARE_A$ with ΔHHI (Origin: Copenhagen)
($r = 0.78$)

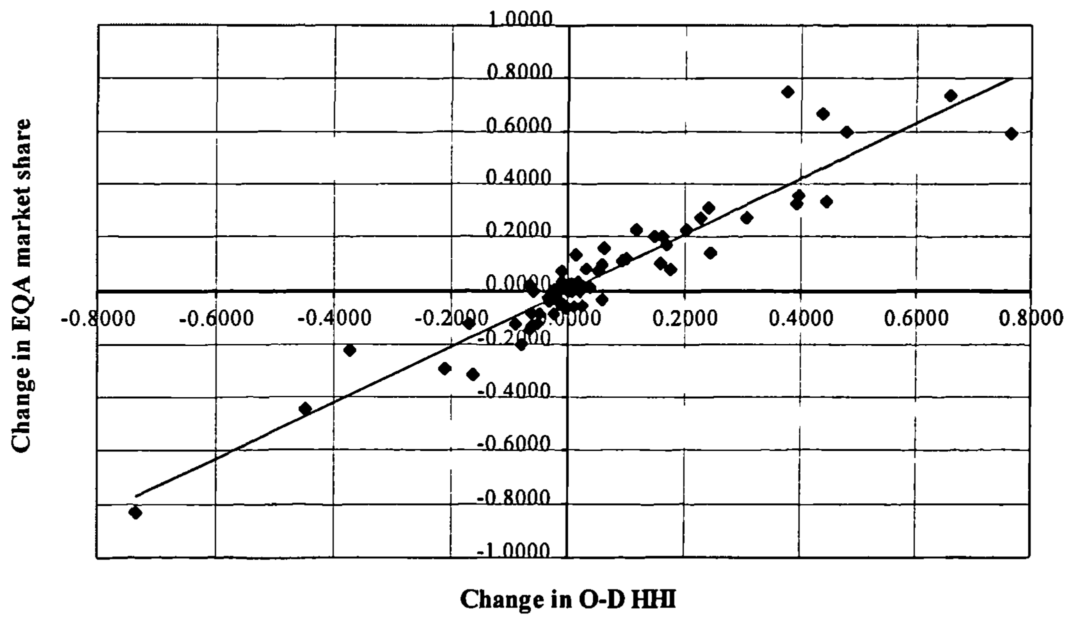


Figure G.2 Variation of $\Delta MSHARE_A$ with ΔHHI (Origin: Vienna)
($r = 0.94$)

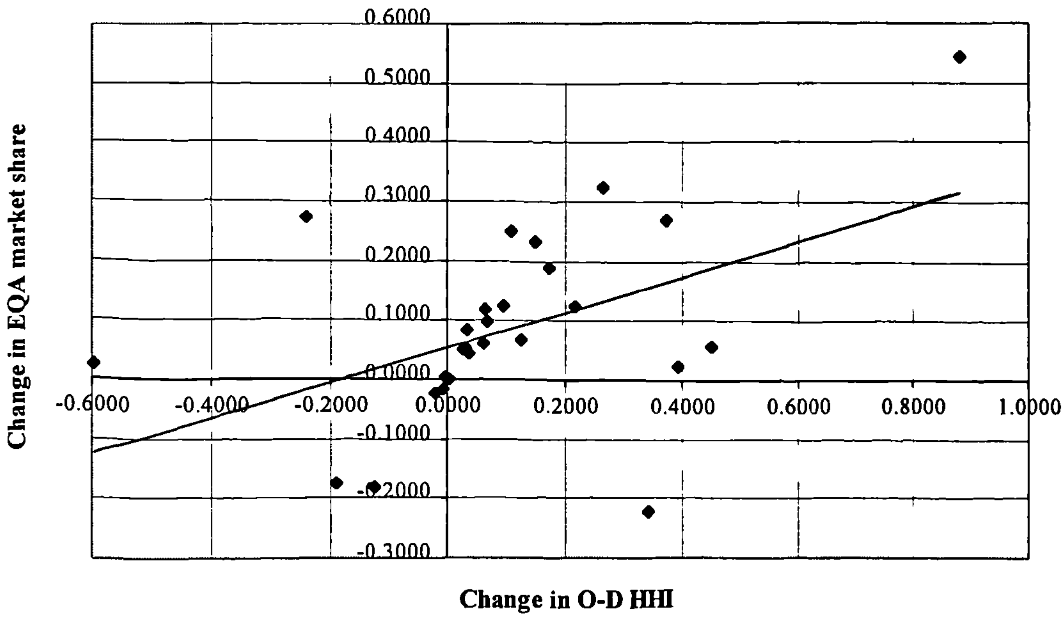


Figure G.3 Variation of $\Delta MSHARE_A$ with ΔHHI (Origin: Zurich)
($r = 0.48$)

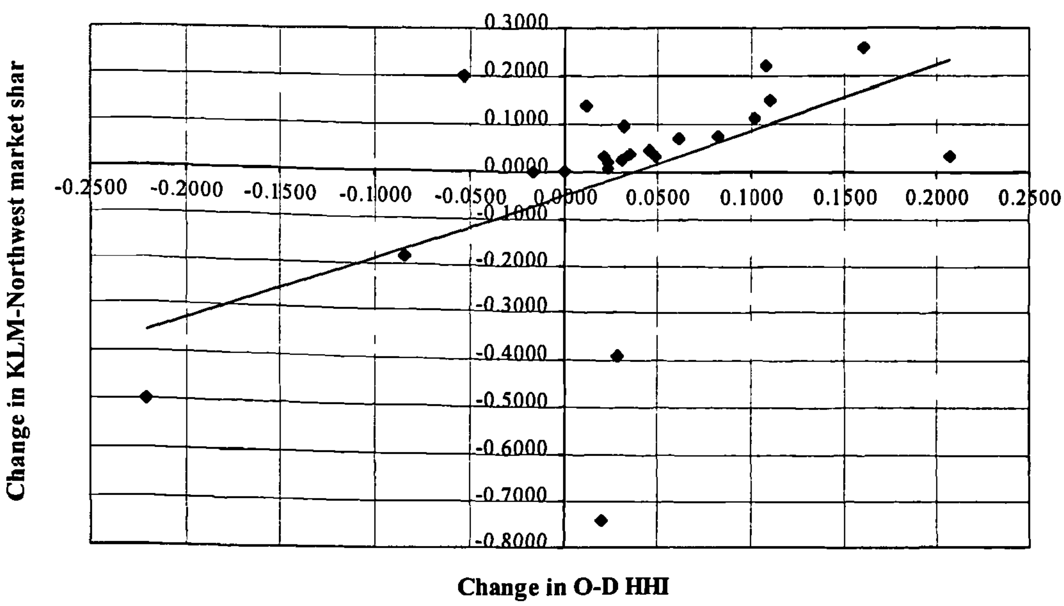


Figure G.4 Variation of $\Delta MSHARE_A$ with ΔHHI (Origin: Amsterdam)
($r = 0.50$)

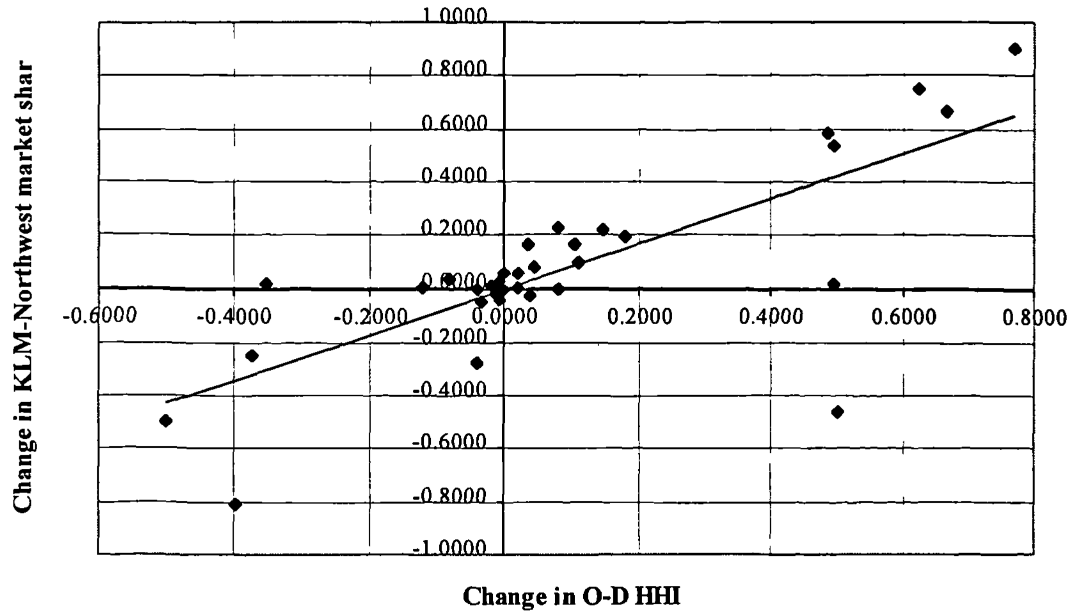


Figure G.5 Variation of $\Delta MSHARE_A$ with ΔHHI (Origin: Boston)
($r = 0.76$)

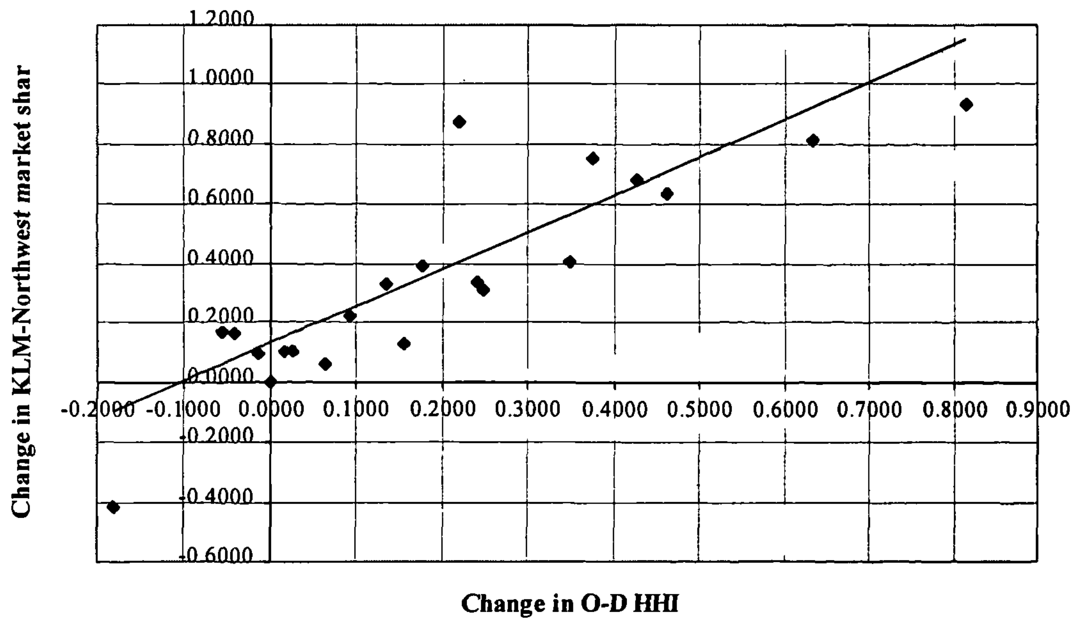


Figure G.6 Variation of $\Delta MSHARE_A$ with ΔHHI (Origin: Minneapolis)
($r = 0.81$)

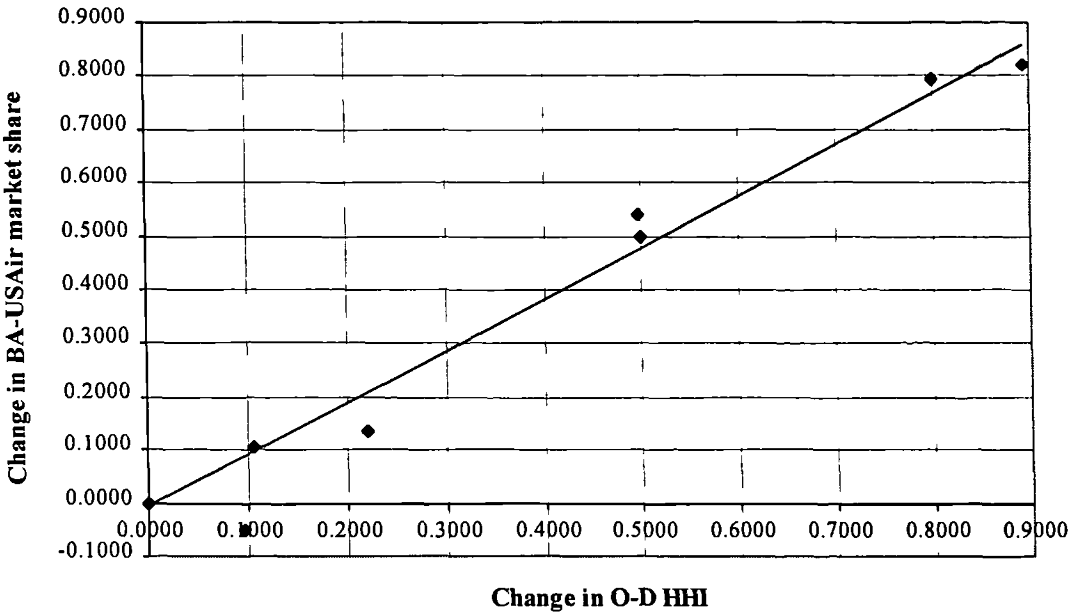


Figure G.7 Variation of $\Delta MSHARE_A$ with ΔHHI (Origin: London)
($r = 0.99$)

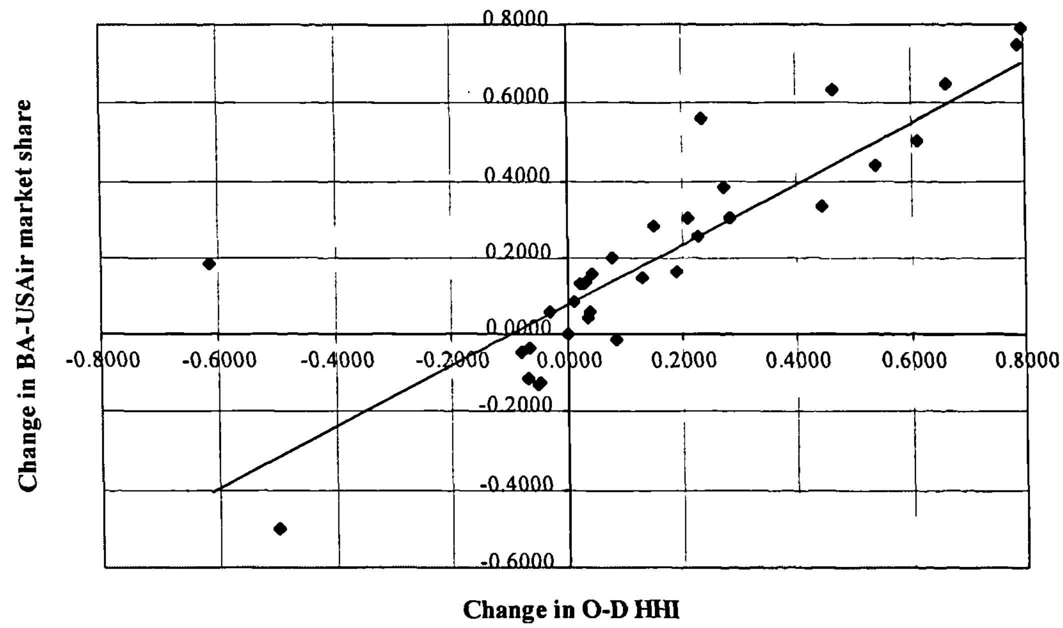


Figure G.8 Variation of $\Delta MSHARE_A$ with ΔHHI (Origin: Philadelphia)
($r = 0.86$)

APPENDIX H: Quantification of aircraft attractiveness

Aircraft	Factor	Aircraft	Factor	Aircraft	Factor
A310	1.16	BAe146-300	0.95	EMB120	0.51
A320	1.12	BAe-ATP	0.81	EMB145	0.66
ATR42	0.72	BAe146-100	0.85	F100	0.93
ATR72	0.82	BAe146-200	0.90	F27	0.75
B1300	0.07	BAe748	0.70	F28-1000/3000	0.84
B1900	0.22	CN212	0.42	F28-20/40/60	0.87
B1900D	0.33	CN235	0.62	F50	0.75
B707	1.12	CRJ	0.71	J31	0.31
B727-100	1.06	DC10	1.50	J41	0.49
B727-200	1.12	DC9-10/20	1.01	L1011	1.42
B727-300	0.97	DC9-30	1.05	LET410	0.33
B737-200	1.00	DC9-40	1.07	MD11	1.52
B737-300	1.03	DC9-50	1.09	MD80	1.13
B737-400	1.06	DHC6	0.16	MD87	1.09
B737-500	1.00	DHC7	0.70	Metro	0.24
B747-100/200	1.61	DHC8-100	0.57	S2000	0.69
B757	1.19	DHC8-300	0.66	S340	0.54
B767-200	1.19	DO228-100	0.22	SD330	0.55
B99	0.12	DO228-200	0.26	SD360	0.61
BAC-111	0.87	EMB110	0.28	YS11	0.74

Source: Boeing (1989)

APPENDIX I: Raw data used in the computation of unit cost and productivity

Austrian Airlines operational data

Year	A/c dep.	Hrs. flown	A/c no.	Pax. no.	RPK (000)	ATK (000)
1994	40855	86291	32	2531834	3833021	812137
1993	48155	95024	32	2643832	3746835	868468
1992	45650	90903	32	2596137	3650314	845112
1991	40549	76340	28	2293526	3853045	671830
1990	35805	68560	24	2261420	2818898	596850
1989	34921	63208	24	2069677	2332628	523295
1988	30139	49996	22	1786787	1705536	386277
1987	29282	47863	19	1732841	1645731	367014
1986	28207	45752	20	1494817	1377178	350393
1985	27257	44082	18	1560446	1426393	337391

Austrian Airlines cost data

Year	Flight pers. (no.)	Cabin pers. (no.)	M&O pers. (no.)	TSP pers. (no.)	'Other' pers. (no.)	Flight pers. ($1000)	Cabin pers. ($1000)	M&O pers. ($1000)	TSP pers. ($1000)	'Other' pers. ($1000)
1994	319	666	704	804	1442	58745	28423	44028	44754	82253
1993	339	719	790	890	1547	54992	38697	41170	44739	97311
1992	320	697	752	938	1567	50487	31579	38457	44934	76158
1991	313	674	718	976	1583	47275	24464	34864	45058	74231
1990	288	687	687	882	1584	44880	23621	33372	41385	74750
1989	267	615	618	851	1494	35369	17929	26038	33391	55841
1988	250	541	596	711	1425	32565	13965	26260	29932	53009
1987	239	391	558	658	1290	26763	11982	24672	27942	46243
1986	219	350	491	642	1244	21029	8976	17959	21210	26443
1985	209	364	474	659	1220	15318	6189	12448	16818	26182

Austrian Airlines cost data (cont'd)

Year	Fuel and oil ($1000)	Insurance ($1000)	Rental ($1000)	Training ($1000)	M&O ($1000)	Station ($1000)	Pax. services ($1000)	TSP ($1000)	Admin. ($1000)
1994	54133	4484	123	1450	60106	101210	81985	186734	37405
1993	56421	2648	2647	3548	61578	104893	83473	189641	40579
1992	59013	1633	20610	5073	61857	108062	86221	193001	47281
1991	49406	1586	12910	6268	52733	93692	71431	165923	38554
1990	51806	2666	1143	3215	50922	83880	71294	155281	38805
1989	35227	879	1454	0	34652	63404	47362	109224	31055
1988	25576	1160	723	1497	31302	52656	40816	93181	26501
1987	26586	1373	326	3164	35766	61480	33115	93058	36725
1986	26401	1752	278	1772	30055	45322	26425	64058	18063
1985	35079	1249	2768	965	17617	29298	18930	54991	13764

Finnair operational data

Year	A/c dep.	Hrs. flown	A/c no.	Pax. no.	RPK (000)	ATK (000)
1994	56333	96715	44	3701281	6490152	1440276
1993	57000	92000	48	3000000	5000000	1250000
1992	59486	90619	50	3247630	4446259	1094817
1991	62000	95000	48	3500000	4250000	1150000
1990	67190	96309	45	3902572	4709345	1074798
1989	73608	94374	41	4026683	4553000	989003
1988	69935	84711	36	3784156	3979552	821489
1987	65049	75867	34	3443913	3545903	733716
1986	57936	66864	33	2897247	2917719	681494
1985	62669	68928	32	3074334	2925016	654830

Finnair cost data

Year	Flight pers. (no.)	Cabin pers. (no.)	M&O pers. (no.)	TSP pers. (no.)	'Other' pers. (no.)	Flight pers. ($1000)	Cabin pers. ($1000)	M&O pers. ($1000)	TSP pers. ($1000)	Other pers. ($1000)
1994	447	1237	1800	1069	2267	69153	22000	52014	28674	60854
1993	450	1252	1846	1150	2368	59925	26610	50232	30464	60867
1992	460	1300	2000	1350	2485	68038	30000	65745	41364	60874
1991	475	1313	2038	1383	2559	77113	34496	70444	47489	60891
1990	472	1292	2089	1287	2916	87381	37000	73523	60477	50112
1989	433	1144	1992	965	2593	75268	27429	56332	52419	48679
1988	403	1119	1853	950	2180	68692	19573	46038	52262	42533
1987	396	774	1782	920	1840	52025	17914	41995	41619	31886
1986	361	752	1777	916	1820	41348	13686	35237	33392	20976
1985	356	708	1745	858	1803	30759	9565	28429	25976	14575

Finnair cost data (cont'd)

Year	Fuel and oil ($1000)	Insurance ($1000)	Rental ($1000)	Training ($1000)	M&O ($1000)	Station ($1000)	Pax. services ($1000)	TSP ($1000)	Admin. ($1000)
1994	95589	5004	50290	150	80892	133132	125661	101838	41558
1993	95102	3511	51136	70	65232	74009	85354	57582	28181
1992	102986	3082	58544	158	82210	85745	144736	78710	31511
1991	112782	2160	44506	413	100537	98466	131516	89339	37739
1990	155146	2785	40013	299	115697	109242	152666	100128	46055
1989	96457	2856	35874	320	37589	86934	126741	90057	45824
1988	86589	2916	31648	360	94887	72648	115372	80687	44324
1987	79369	4254	23441	380	76703	59907	91015	70447	38587
1986	63125	4875	16814	757	62187	52647	71171	58064	32034
1985	90622	3643	14273	373	51356	49006	54030	46217	26205

REFERENCES

ABC World Airways Guide, Reed Travel Group, Dunstable, Bedfordshire

Abrahams, M. (1983) 'A service quality model of air travel demand: An empirical study', *Transportation Research*, **17A**, (5), pp. 385-393

Achrol, R. S., Scheer, L., and Stern, L. W. (1990) *Designing successful transorganisational marketing alliances*, Report No. 90-118, Marketing Science Institute, Cambridge, Massachusetts

Achrol, R. S., and Stern, L. W. (1988) 'Environmental determinants of decision-making uncertainty in marketing channels', *Journal of Marketing Research*, **25**, (February), pp. 36-50

Adkins, B. (1994) *Air Transport and EC competition law*, Sweet & Maxwell, London

Airline Business, Reed Business Publication

Alamdari, F. E. (1989) *Airline deregulation: An analysis under different regulatory and operating environments*, Ph.D. dissertation, Cranfield University, Bedfordshire

Alamdari, F. E., and Black, I. G. (1992) 'Passengers' choice of airline under competition: The use of the logit model', *Transport Reviews*, **12**, (2), pp. 153-170

Anderson, J. E., and Kraus, M. (1980) 'Quality of service and the demand for air travel', *The Review of Economics and Statistics*, pp. 533-540

Antoniou, A. (1991) 'Economies of scale in the airline industry: The evidence revisited', *The Logistics and Transportation Review*, **27**, (2), pp. 159-184

Aviation Week and Space Technology, (1988), 'European consortia-Three suppliers dominate the field', (February 8), pp. 63-64

Badaracco, J. L. (1991) The knowledge link: How firms compete through strategic alliances, Harvard Business School Press, Boston

Bailey, E. E., Graham, D. R., and Kaplan, D. P. (1984) *Deregulating the airlines*, MIT Press, Cambridge, Massachusetts

Balfour, J. (1995) 'Airline mergers and marketing alliances-Legal constraints', *Air and Space Law*, **20**, (3), pp. 112-117

Bathgate, M. (1995) 'Capitalising on franchising to access new markets and broaden product availability at lowest cost-The franchisee's experience', Proceedings of the IRR Conference: *Creating and managing successful tactical and strategic airline alliances and co-operations*, June 1995, London

Baumol, W. J., Panzar, J. C., and Willig, R. D. (1982) *Contestable markets and the theory of industrial structure*, Harcourt Brace Jovanovich, New York

Belobaba, P. P., and Acker, J. V. (1994) 'Airline market concentration-An analysis of US origin-destination markets', *Journal of Air Transport Management*, **1**, (1), pp. 5-14

Beng, C. L. (1989) 'Industry privatisation' in *The changing world of air transport-Searching for a proper balance*, International Air Transport Association, Geneva, pp. 45-52

Boeing (1989) 'The market share model-A forecasting tool for market share analysis', *Boeing Commercial Airplanes*, Seattle, Washington

Borenstein, S. (1989) 'Hubs and high fares: Dominance and market power in the US airline industry', *RAND Journal of Economics*, **20**, (3), (Autumn), pp. 344-365

Borenstein, S. (1990) 'Airline mergers, airport dominance, and market power', in Oaxaca L., and St. John, W. (Eds.) *The American Economic Review, Papers and Proceedings of the hundred and second annual meeting of the American Economic Association*, Atlanta, Georgia, pp. 400-404

Borys, B., and Jemison, D. (1989) 'Hybrid arrangements as strategic alliances: Theoretical issues in organisational combinations', *Academy of Management Review*, **14** (2) pp. 234-249

Brueckner, J. K., Dyer, N. J., and Spiller, P. T. (1992) 'Fare determination in airline hub-and-spoke networks', *Rand Journal of Economics*, **23**, (3), pp. 309-333

Bucklin, L., and Sengupta, S. (1992) *Balancing co-marketing alliances for effectiveness*, Report No. 92-120, Marketing Science Institute, Cambridge, Massachusetts

Bullard, A. (1995) 'Why alliances might not be the route to the future', Proceedings of the IIR Conference : *Creating and Managing Successful Tactical and Strategic Airline Alliances and Co-operations*, June 1995, London

Burgess, B. (1995) 'Franchisers and franchisees - A win-win situation?' Proceedings of the Airline Business and Mercer Management Consulting Conference: *Challengers to the major airlines*, March 1995, London

Burton, J. (1994) *Collaboration vs. competition*? Inaugural lecture, Birmingham Business School, The University of Birmingham

Burton, J., and Hanlon, P. (1994) 'Airline alliances: Co-operating to compete?', *Journal of Air Transport Management*, **1** (4) pp. 209-227

CAA (1995) *The Single European Aviation Market: Progress so far*, September, Civil Aviation Authority, London

Call, G. D., and Keeler, T. E. (1985) 'Airline deregulation, fares, and market behaviour: Some empirical evidence' in Daugherty, A. F. (Ed.) *Analytical Studies in Transport Economics*, Cambridge University Press, Cambridge, Massachusetts

Cameron. D. (1992) 'Every question answered?', *Airline Business*, (April), pp. 50-51, 53

Carlton, D. W., Landes, W. M., and Posner, R. A. (1980) 'Benefits and costs of airline mergers: A case study', *The Bell Journal of Economics*, **11**, (1), pp. 65-83

Caves, R. E. (1962) *Air transport and its regulators*, Harvard University Press, Cambridge, Massachusetts

Caves, D. W., Christensen, L. R., and Tretheway, M. W. (1984) 'Economies of density versus economies of scale: Why trunk and local service airline costs differ', *Rand Journal of Economics*, **15**, pp. 471-489

Chakravarthy, B. S. (1986) 'Measuring strategic performance', *Strategic Management Journal*, **7**, pp. 437-458

Cheng Chia-Jui (1992) 'The changing features of aviation policy in Asian countries', in Masson-Zwaan, T. L., and Mendes de Leon, P. M. (Eds.), *Air and Space Law: de Lege Ferenda*, Kluwer Academic Publishers, Netherlands, pp. 3-9

Cohas, F. H., Belobaba, P. P., and Simpson, R. W. (1995) 'Competitive fare and frequency effects in airport market share modelling', *Journal of Air Transport Management*, **2**, (1), pp. 33-45

Comite des Sages (1994) *Expanding horizons, Civil aviation in Europe, an action programme for the future*, European Commission, Brussels.

Contractor, F. J. and Lorange, P. (1988) *Competitive strategies in international business*, Lexington Books, Massachusetts

Coombs, T. (1993) 'Surviving the new world order', *The Avmark Aviation Economist*, (April), pp. 6-8

Cranfield University (1996) *Single market review 1996-Impact on services, air transport*, Study for the Commission of European Communities, Department of Air Transport, Cranfield University, Bedfordshire

Cravens, W. D., Cravens, K. S., and Shipp, S. H. (1993) 'Analysis of co-operative interorganisational relationships, strategic alliance formation, and strategic alliance effectiveness', *Journal of Strategic Marketing*, **1**, pp. 55-70

Crumley, B. (1993) 'New beachhead in France', *Air Transport World*, (June), pp. 26-29

Deans, A. (1992) 'Flight to a merger: Australia's main airlines to form mega-carrier', *Far Eastern Economic Review*, **155**, (25), (June 25), pp. 51-52

Debbage, K. G. (1994) 'The international airline industry: Globalisation, regulation and strategic alliances', *Journal of Transport Geography*, **2**, (3), pp.190-203

de Groot, J. E. (1994) 'Code-sharing; United States' policies and the lessons for Europe', *Air and Space Law*, **19**, (2), pp. 62-81

Dempsey, P. S., and Goetz, A. R. (1992) *Airline deregulation and laissez-faire mythology*, Quorum Books, Westport, Connecticut

Dennis, N. (1994) 'Scheduling strategies for airline operations', *Journal of Air Transport Management*, **1**, (3), (September), pp. 131-144

De Vany, A. S. (1974) 'The effect of price and entry regulation on airline output, capacity and efficiency', *Bell Journal of Economics*, **6**, (Spring), pp. 327-345

DiMaggio, P., and Powell, W. W. (1983) 'The iron cage revisited: Institutional isomorphism and collective rationality in organisational fields', *American Sociological Review*, **48**, pp. 147-160

Doganis, R. (1991) *Flying off course-The economics of international airlines*, (2nd. edition), HarperCollins*Academic*, London

Doganis, R. (1993) *Dinosaurs and pterodactyls-European airlines after liberalisation*, Inaugural lecture, Cranfield University, Bedfordshire

Douglas, G. W., and Miller III, J. C. (1974) *Economic regulation of air transport: Theory and policy*, Brookings Institution, Washington, D.C.

Doz, Y. (1994) 'Are alliances inherently unstable?' Proceedings of the Acquisitions Monthly and Arthur D. Little one-day conference: *Strategic alliances-Making them work*, April 1994, London

Dresner, M., and Tretheway, M. W. (1992) 'Modelling and testing the effect of market structure on price', *Journal of Transport Economics and Policy*, **26**, (2), pp. 171-184

Driscoll, J. W. (1978) 'Trust and participation in organisational decision making as predictors of satisfaction', *Academy of Management Journal*, **21**, pp. 44-56

Eads, G. C., Nerlove, M., and Raduchel, W. (1969) 'A long-run cost function for the local service airline industry: An experiment in non-linear estimation', *Review of Economics and Statistics*, **51**, pp. 258-270

Eads, G. C. (1972) *The local service airline experiment*, Brookings Institution, Washington, D.C.

Emerson, R. (1962) 'Power-dependence relations,' *American Sociological Review*, **27**, (February), pp. 31-41

Endres, G. (1995) 'British Airways' branding iron', *Commuter World*, **12**, (1), (February/March), pp. 16-19

European Data and Statistics, 1983-1995, Euromoney Plc., London

Evans, W. N., and Kessides, I. N. (1993) 'Localised market power in the US airline industry', *Review of Economics and Statistics*, **75**, (1), pp. 66-75

Faulkner, D. (1995) *International strategic alliances: Co-operating to compete*, McGraw-Hill, London

Feldman, J. M. (1989) *Development strategies for the world's airlines'*, Special Report No. 1133, The Economist Intelligence Unit Limited

Feldman, J., M. (1991) 'SAS: Playing partners', *Air Transport World*, (November), pp. 102-104, 106

Feldman, J., M. (1993a) 'Spanning the globe', *Air Transport World*, (November), pp. 97-98.

Feldman, J. M. (1993b) 'Anatomy of an alliance', *Air Transport World*, (April), pp. 32-34, 36-38

Fenema, P. (1992) 'Substantial ownership and control as airpolitical criteria', in Masson-Zwaan, T. L., and Mendes de Leon, P. M. (Eds.), *Air and Space Law: de Lege Ferenda*, Kluwer Academic Publishers, Netherlands, pp. 27-41

Flanagan, A., and Marcus, M. (1993) 'The secrets of a successful liaison', *The Avmark Aviation Economist*, (January/February), pp. 20-23

Freud, D. (1995) 'Forming strategic alliances with or without equity investment-What are the influencing factors and benefits?' Proceedings of the IIR Conference : *Creating and managing successful tactical and strategic airline alliances and co-operations*, June 1995, London

Gallagher, J. (1994) 'Tagging along', *Airline Business*, (July), p. 25

Gallagher, J. (1996) 'A clearer direction', *Airline Business*, (June), p. 23

GAO (1995) *International aviation-airline alliances produce benefits but effect on competition is uncertain*, US General Accounting Office, Washington, D.C.

Gialloretto, L. (1988) *Strategic airline management-The global war begins*, Pitman Publishing, London

Gillen, D. W., Oum, T. H., and Tretheway, M. W. (1985) *Airline cost and performance: Implications for public and industry policies*, Centre for Transportation Studies, University of British Columbia, Canada

Goldman, M. F. (1995) 'Coded warnings', *Airline Business*, (January), pp. 26-29

GRA, Inc. (1994) *A study of international code sharing, Executive summary*, Gellman Research Associates Inc., Washington, D.C.

Graham, B. (1995) *Geography and air transport*, John Wiley and Sons. New York

Grumbridge, J. L. (1966) *Marketing management in air transport*, George Allen & Unwin Ltd., London

Gulati, R., Khanna, T., and Nohria, N. (1994) 'Unilateral commitments and the importance of process in alliances', *Sloan Management Review*, (Spring), pp. 61-69

Hamel, G. (1991) 'Competition for competence and inter-partner learning with international strategic alliances,' *Strategic Management Journal*, **12**, pp. 83-103

Hanlon, P. J. (1996) *Global airlines-Competition in a transnational industry*, Butterworth-Heinemann Ltd., London

Harrigan, R. K. (1987) 'Strategic alliances: Their new role in global competition', *Columbia Journal of World Business*, (Summer), pp. 67-69

Harrigan, R. K. (1988). 'Strategic alliances and partner asymmetries', in Contractor, F. J., and Lorange, P. (Eds.) *Cooperative strategies in international business*, Lexington Books, Lexington, MA., pp. 206-224

Harrigan, R. K., and Newman, W. (1990) 'Bases of interorganisation co-operation: Propensity, power, persistence', *Journal of Management Studies*, **27**, (4), pp. 417-434

Hartnell, N. (1994) 'Making electronics alliances work', Proceedings of the Acquisitions Monthly and Arthur D. Little conference: *Strategic alliances-Making them work*, (April), London.

Hawley, A. (1950) *Human ecology*, Ronald Press, New York

Houtte, B. (1993) 'Community competition law in the air transport sector (II)', *Air and Space Law*, **18**, (6), pp. 275-287

Howarth, C. S. (1994) 'The role of alliances in the development of technology', *Technovation*, **14**, (4), pp. 243-257

Humphreys, B. K. (1988) 'Economies of density, scale and scope', *The Avmark Aviation Economist*, (June), pp. 10-11

Humphreys, B. K. (1994a) 'Do airlines still need to own CRSs', *The Avmark Aviation Economist*, **11**, (3), (November), pp. 12-20

Humphreys, B. K. (1994b) 'The implications of international code-sharing', *Journal of Air Transport Management*, **1**, (4), pp. 195-207

Hurdle, G. J., Johnson, R. L., Joskow, A. S., Werden, G. J., and Williams, M. A. (1989) 'Concentration, potential entry, and performance in the airline industry', *The Journal of Industrial Economics*, **38**, (2), (December), pp. 119-139

IATA (1993) *IATA aviation regulatory watch, Fifth report*, Geneva

IATA World Air Transport Statistics, International Air Transport Association, Geneva

ICAO (1985) *Manual on air traffic forecasting*, Doc 8991-AT/722/2, Second edition, International Civil Aviation Organisation, Montreal, Canada

ICAO Digest of Statistics-Financial Data, International Civil Aviation Organisation, Montreal, Canada

ICAO Digest of Statistics-Traffic by Flight Stage, International Civil Aviation Organisation, Montreal, Canada

International Data and Statistics, 1983-1995, Euromoney Plc., London

Ippolito, R. (1981) 'Estimating airline demand with service quality variables', *Journal of Transport Economics and Policy*, **15**, (1), (January), pp. 7-15

Jarillo, C. (1993) *Strategic networks: Creating the borderless organisation*, Butterworth-Heinemann, Oxford

Jenks, C. (1990) 'Can Europe replicate US hubbing?', *The Avmark Aviation Economist*, (November/December), pp. 10-12

Jennings, M. (1990) 'Strategic illusions', *Airline Business*, (April), pp. 24-30.

Jennings, M. (1994) 'Snowed under', *Airline Business*, (April), pp. 26-29

Jennings, M. (1995a) 'What's in a code?', *Airline Business*, (June), pp. 64-67

Jennings, M. (1995b) 'If you can't beat 'em......', *Airline Business*, (January), pp. 22-23, 25

Jennings, M. (1996a) 'Alliances still not immune from risk', *Airline Business*, (July), p. 74

Jennings, M. (1996b) 'Poisoned pals', *Airline Business*, (July), pp. 22-24

Johnson, R. L. (1985) 'Networking and market entry in the airline industry: Some early evidence from deregulation', *Journal of Transport Economics and Policy*, **19**, pp. 299-304

Jordan, W. A. (1970) *Airline regulation in America: Effects and imperfections*, The Johns Hopkins University Press, Baltimore

Jordan, W. A. (1988) 'Problems stemming from airline mergers and acquisitions', *Transportation Journal*, (Summer), pp. 9-30

Jorde, T., and Teece, D. (1989) 'Competition and co-operation: Striking the right balance', *California Management Review*, (Spring), pp. 25-37

Jorge-Calderon, J. D. (1995) 'Evaluating the effectiveness of airline operating strategies in the UK international markets', Proceedings of the *UTSG Annual Conference*, 4-6 January, Cranfield University

Kanafani, A. A. (1983) *Transportation demand analysis*, McGraw-Hill, Inc. US

Kanafani, A. A., and Ghobrial, A. (1985) 'Airline hubbing-Some implications for airport economics', *Transportation Research*, **19A**, (1), pp. 15-27

Kanter, R. (1989) 'Becoming PALS: Pooling, allying, and linking across companies', *The Academy of Management Executive*, **3**, (3), pp. 183-191

Kasper, D. M. (1988) *Deregulation and globalisation-Liberalising international trade in air services*, Ballinger Publishing Company, Cambridge, Massachusetts

Keeler, T. E. (1972) 'Airline regulation and market performance', *Bell Journal of Economics and Management*, **3**, pp. 399-432

Kilhstedt, T., and Harrington, M. (1991) 'Wedding night jitters', *Airline Business*, The Skies in 1991, pp. 12-15

Knibb, D. (1994) 'Reluctant allies', *Airline Business*, (March), p.40-41, 43

KPMG (1996) *Strategic issues and current trends in the international airline industry*, KPMG International Airline Group in conjunction with IATA

Laine, C. R. (1995) 'The Herfindahl-Hirschman index: A concentration measure taking the consumer's point of view', *The Antitrust Bulletin*, **40**, (2), (Summer), pp. 423-432

Landreth, O. (1992) *European corporate strategy: Heading for 2000*, St. Martin's Press, New York

Lei, D., and Slocum, W. (Jr.) (1992) 'Global strategic alliances: Payoffs and pitfalls', *Organisational Dynamics*, (Fall), pp. 81-97

Levine, M. E. (1987) 'Airline competition in deregulated markets: Theory, firm strategy, and public policy', *Yale Journal on Regulation*, **4**, (2), pp. 393-494

Lewis, J. D. (1990) *Partnerships for profit-Structuring and managing dtrategic alliances*, Free Press, New York

Lindquist, J. (1996) 'Marriages made in heaven', *The Avmark Aviation Economist*, (January/February), pp. 12-13

Lorange, P., and Roos, J. (1993) *Strategic alliances-Formation, implementation and evolution*, Blackwell Business, Cambridge, Massachusetts

Maillebiau, E., and Hansen, M. (1995) 'Demand and consumer welfare impacts of international airline liberalisation', *Journal of Transport Economics and Policy*, **29**, (2), (May), pp. 115-136

Mauldin, M. G. (1989) *Hub dominance and pricing in the airline industry*, Ph.D. dissertation, University of California at Berkeley, California

McKenna, J. (1993) 'USAir-BA pact will spark new transatlantic battle', *Aviation Week and Space Technology*, **138**, (7), February 15, p.31

McShan, S., and Windle, R. (1989) 'The implications of hub-and-spoke routing for airline costs and competitiveness', *Logistics and Transportation Review*, **25**, (3), pp. 209-230

Mead, K. M. (1995) *International aviation-better data on code-sharing needed by DoT for monitoring and decisionmaking*, Statement before the Subcommittee on Aviation, Committee on Commerce, Science and Transportation, United States Senate, US General Accounting Office, Washington, D.C.

Meyer, J. R., and Oster, C. V. (1987) *Deregulation and the future of intercity passenger travel*, The MIT Press, Cambridge, Massachusetts

Miller III, J. C. (1979) 'Airline market shares vs. capacity shares and the possibility of short-run loss equilibria', *Research in Law and Economics*, **1**, pp. 81-96

Milliken, F. J. (1987) 'Three types of perceived uncertainty about the environment: State, effect and response uncertainty', *Academy of Management Review*, **12**, (1), pp. 133-143

Morrison, S. A., and Winston, C. (1990) 'The dynamics of airline pricing and competition', in Oaxaca L., and St. John, W. (Eds.) *The American Economic Review, Papers and Proceedings of the hundred and second annual meeting of the American Economic Association*, Atlanta, Georgia, pp. 389-393

Murphy, C (1995) 'Code-sharing-Is it airline's gain and the customer's loss or does it offer a seamless and extensive service?' Proceedings of the IRR Conference: *Creating and managing successful tactical and strategic airline alliances and co-operations*, June 1995, London

Nelms, D. W. (1992) 'Air Russia: Grinding to a start', *Air Transport World*, **29**, 11, (November), p: 88-89.

Norusis, M. J. (1993) *SPSS for Windows, Base system user's guide, Release 6.0*, SPSS Inc.

Nuutinen, H. (1995) 'Could United rescue USAir from the next lites?', *The Avmark Aviation Economist*, (September/October), pp. 2-6

O'Connor, W. E. (1995) *An introduction to airline economics*, 5th. edition, Praeger Publishers, Westport, Connecticut

Odell, M. (1994) 'Slowly but surely?', *Airline Business*, (July), p. 51

O'Donovan, H. (1995) 'The impact of current regulatory restrictions on alliances and their future importance to the industry', Proceedings of the IRR Conference: *Creating and managing successful tactical and strategic airline alliances and co-operations*, June 1995, London

Ohmae, K. (1992) 'The global logic of strategic alliances', in Bleeke, J. And Ernst, D. (eds.) *Collaborating to compete-Using strategic alliances and acquisitions in the global marketplace*, John Wiley and Sons, New York

Oliver, C. (1990) 'Determinants of interorganisational relations: Integration and future directions', *Academy of Management Review*, **15** (2), pp. 241-265

Oliver, C. (1994) 'Has British Airways slipped up', *Corporate Finance*, (May), pp. 18-24

Oster, C. V., and Pickrell, D. H. (1986) *A study of the regional airline industry: The impact of marketing alliances*, US Department of Transportation

Oum, H. T., Taylor, A. J., and Zhang, A. (1993) 'Strategic airline policy in the globalising airline networks', *Transportation Journal*, **32**, (3), (Spring), pp. 14-30

Parkhe, A. (1991) 'Interfirm diversity, organisational learning, and longevity in global strategic alliances', *Journal of International Business Studies*, (Fourth quarter), pp. 579-600

Parkhe, A. (1993) 'Strategic alliance structuring: A game theoretic and transaction cost examination of interfirm co-operation', *Academy of Management Journal*, **36**, (4), pp. 794-826

Pickrell, D. (1991) 'The regulation and deregulation of US airlines', in Button, K. (ed.) *Airline deregulation-International experiences*, David Fulton Publishers, London

Porter, M. (1985) *Competitive advantage*, The Free Press, New York

Porter, M., and Fuller, M. (1986) 'Coalitions and global strategy.' in M. E. Porter (ed.) *Competition in global industries*, Harvard University Press, Cambridge, Massachusetts, pp. 315-343

Powell, W. W. (1987) 'Hybrid organisational arrangements: New form or transitional development?', *California Management Review*, (Fall), pp. 67-81

Prodromidis, K. P., and Frangos, T. (1995) 'Public or private enterprises in the airline industry', *International Journal of Transport Economics*, **22**, (1), (February), pp. 86-95

Pugh, A. (1989) 'Mergers, alliances and competition', in *The changing world of air transport-Searching for a proper balance*, International Air Transport Association, Geneva, pp. 37-44

Reed, A. (1994a) 'ATLAS unburdened', *Air Transport World*, (November), pp. 68, 70

Reed, A. (1994b) 'The tumbling of ALCAZAR', *Air Transport World*, (January), p. 33

Reid, S. R., and Mohrfield, J. W. (1973) 'airline size, profitability, mergers and regulation', *Journal of Air Law and Commerce*, **39**, pp. 167-183

Ricout, P. (1994) *Strategies for an intra-European airline co-operation:-A case study of the European Quality Alliance (SAS, Swissair, Austrian Airlines) with particular reference to market share analysis and cost benefits*, MSc. thesis, College of Aeronautics, Cranfield University, Bedfordshire

Shaw, S., and Ivy, R. L. (1994) 'Airline mergers and their effect on network structure', *Journal of Transport Geography*, **2**, (4), pp. 234-246

Shenton, H. (1994a) 'Is airlines' gain consumers' loss?', *The Avmark Aviation Economist,* (October), pp. 13-20

Shenton, H. (1994b) 'GRA report sanctifies DoT policy,' *The Avmark Aviation Economist*, (December), pp. 2-5

Sommerlatte, T. (1994) 'Managing alliance strategy', Proceedings of the *Acquisitions Monthly* and *Arthur D. Little* conference: Strategic alliances-Making them work, April 1994, London

Sorensen, F (1995) 'Airline alliances and co-operations', Proceedings of the IRR Conference: *Creating and managing successful tactical and strategic airline alliances and co-operations*, June 1995, London

Sparaco, P. (1993) 'Eurocarriers take bold merger action', *Aviation Week and Space Technology*, **138**, (18), May 3, pp. 26-27

Spekman, R., and Sawhney, K. (1990) *Towards a conceptual understanding of the antecedents of strategic alliances*, Working paper 90-114, Marketing Science Institute, Cambridge, Massachusetts

Stodden, J. R. (1988) 'Investors endorse British Airways' strategies for growth', *Aviation Week and Space Technology*, **129**, (3), pp. 99, 101

Straszheim, M. R. (1969) *The international airline industry*, Brookings Institute, Transport Research Programme, Washington D.C.

Taneja, N. K. (1968) 'Airline competition analysis', *FTL Report R-68-2*, Flight Transportation Laboratory, MIT, Cambridge, Massachusetts

Taneja, N. K. (1976) *The commercial airline industry: Managerial practices and regulatory policies*, Lexington Books, Lexington, Massachusetts

Taneja, N. K. (1978) *Airline traffic forecasting-A regression analysis approach'*, Lexington Books, Lexington, Massachusetts

Taneja, N. K. (1981) *The commercial airline industry-Managerial practices and regulatory policies*, Lexington Books, Lexington, Massachusetts

Taneja, N. K. (1984) *Airlines in transition*, Lexington Books, Lexington, Massachusetts

Thorelli, H. B. (1986) 'Networks: Between markets and hierarchies', *Strategic Management Journal*, **7**, pp. 37-51

Van de Ven, A. H., and Ring, P.S. (1994) 'Developmental processes of co-operative interorganisational relationships', *The Academy of Management Review*, **19** (1), pp. 90-118

Walters, J. (1996) 'Rivals let fly at American deal with BA', *The Observer*, (June 16), p. 6

Weisman, E. (1990) *Trade in services and imperfect competition-Application to international aviation*, Kluwer Academic Publishers, Netherlands

Wells, A. T. (1989) *Air transportation-A management perspective*, (2nd. edition), Wadsworth Inc., California

Wheatcroft, S. (1990) 'Towards transnational airlines', *Tourism management*, (December), pp. 353-358

Wheatcroft, S. (1994) *Aviation and tourism policies: Balancing the benefits*, Routledge, London

Whitaker, R. (1993) 'An American adventure', *Airline Business*, (November), pp. 30-33

White, J. L. (1979) 'Economies of scale and the question of 'natural monopoly' in the airline industry', *Journal of Air Law and Commerce*, 44, (3), pp. 545-573

Williams, G. (1990) *Establishing an effective regulatory policy for the European airline industry*, Ph.D. thesis, College of Aeronautics, Cranfield University

Williams, G. (1994) *The airline industry and the impact of deregulation*, (Revised edition), Avebury Aviation, Ashgate Publishing Limited, UK

Williamson, O. (1985) *The economic institutions of capitalism*, Free Press, New York

Wood, J. (1994) 'Making airline alliances work', Proceedings of the Acquisitions Monthly and Arthur D. Little Conference: *Strategic Alliances-Making them work*, June 1994, London

Yoshino, M. Y., and Rangan, U. S. (1995) *Strategic alliances-An entrepreneurial approach to globalization*', Harvard Business School Press, Boston, Massachusetts

Youssef, W. A. (1992) *Causes and effects of international airline equity alliances*, Ph.D. Dissertation Series UCB-ITS-DS-92-1, Institute of Transportation Studies, University of California, Berkeley, California

Youssef, W. A., and Hansen, M. (1994) 'Consequences of Strategic Alliances between International Airlines: The Case of Swissair and SAS', *Transportation Research*, 28A (5), pp. 415-443

Zand, D. (1972) 'Trust and managerial problem solving', *Administrative Science Quarterly*, **17**, pp. 229-239

Zenker, E. (1992) 'Global alliances bring rewards for Swissair', *The Avmark Aviation Economist*, (December), pp. 8-9