

Airline code-share alliances with antitrust immunity and their competitive effects
on international passenger output: an application to monopolistic and oligopolistic
network structures on the trans-Atlantic market

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Abstract: <p>The air travel sector is one of the world's most regulated industries. Yet, as the environment of air travel business have been heading towards more consolidated airline market structures, it highlights some vital questions regarding competition outcomes on airline alliance formations. Airline alliances take many forms depending on the degree of integration. The most distinguished types are code-share alliances and antitrust-immunised alliances. Code-sharing effectively expands the route network of each partner airline so as to increase the alliance network size without needing to add planes. Receiving antitrust immunity enables an alliance to collude legally on some routes, thus avoiding the negative externality of double marginalisation caused by "sub fares". Moreover, alliance routes are characterised as both parallel and complementary in nature. The former refers to routes where airlines competed prior to the alliance, and the later where partners link up networks to feed traffic to each other.</p> <p>This thesis aims at analysing the positive and negative attributes resulting from alliance formation. Specifically, the investigation answers whether code-sharing contracts increase traffic levels, and subsequently, if granting antitrust immunity induces that effect. To answer these questions the research uses passenger output data from the 1989-2007 period. Testing partner traffic, non-partner traffic, and total traffic for three different alliances on the trans-Atlantic market shows that code-sharing indeed has a positive effect on traffic volumes, fortifying prevailing research. However, this thesis argues that the supportive nature of this empirical finding is dependent on statistical test characteristics. The statistical test performed in this paper shows that results with respect to code-sharing may not hold when correcting passenger output for aggregated levels. Furthermore, antitrust immunity is found positive and significant in most tests, suggesting that granting antitrust immunity, to these alliances, is justifiable from an authority perspective. In addition, findings using a constructive estimation indicate that antitrust immunity in the LH/UA case may not be <i>de facto</i> Pareto optimal. In order to pursue defending this claim, however, further and more fundamental analysis is required. Finally, investigating code-sharing in a monopoly network, the paper argue that airlines conceivably increase load factors and extract higher yields resulting from holding up code-sharing capacity growth.</p>	
Keywords: airline alliance, code-sharing, antitrust immunity, vertical integration, double marginalisation, monopoly, and oligopoly structures, hub-and-spoke network	

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1 Introduction

For the past few decades the international air traffic industry has gradually moved towards more liberate open skies. Nevertheless, it still remains one of the most restrictive and regulated industries in international trade. Airlines are obligated to operate under several different regulations and stipulations (national, regional and international). These impediments restrict airlines from flying wherever they choose, hence, it is almost impossible for carriers to establish extensive global networks. Foreign ownership restrictions and current bilateral agreement constitute free trade obstacles in aviation. Therefore, consumer preferences and competition between rival airline have increasingly prompt carriers to form strategic alliances.

After the deregulation of the U.S. airline industry in 1978, some major formal changes has developed in the operational structure of airlines. At the beginning of the 1980s most scheduled airlines started to use the so called hub- and- spoke networks, where passengers are concentrated at a major hub waiting to be transferred to final destinations. During the 1990s a new strategic formation was developed: strategic international alliances between two or more airlines. The most distinguishing strategic alliance characteristics among partner airlines are the use of code-sharing. Code-sharing combines the operating services of at least two different airlines permitting carriers issuing tickets on partner flight segments¹. Consequently, code-sharing enables each carrier integrate their service networks with strategic partners to form global service networks. Without an alliance interline fares are set through strategic interaction based on “sub fares” where each airline chooses its own price for the segment it operates. Using “sub fares” imposes a negative externality known as the *double marginalisation problem*. If antitrust authorities grant a pair of airlines antitrust immunity, it enables these partners to circumvent “sub fares”. Thus, overall fares are set in cooperative fashion, focusing on joint profit. This form of vertical integration, using code-sharing and antitrust immunity, is expected to lead to lower fares, greater passenger volumes, and increasing passenger benefit (Brueckner, 2001).

International alliances offer additional market advantage, as an alliance permits network expansion, where supplementary market size allow exploiting partners extra traffic feed, with little extra cost. Hence, traffic on alliance routes are likely to increase since cross-border alliance enables expansion into previously inaccessible markets. Therefore, the alliance is able to develop existing markets and accessing new ones.

¹ A flight segment is defined as a take-off and landing

However, there are different characteristics that need further investigation before simply stating that the effects of code-sharing and antitrust immunity both are positive from a welfare perspective. Despite the benefits of forming alliances, code-sharing is also viewed as a device to reduce competition. If two airlines that prior to alliance were competitors on specific segments are allowed legal collusion, they presumably increase combined market power. Furthermore, an alliance makes it possible for airlines to price-discriminate between passengers. This occurs as code-sharing allows airlines to distinguish between connecting and non-stop passengers. The expected market impact plays a distinctive role when antitrust authorities decide whether to encourage or restrict alliance formation.

The U.S Department of Transportation (DoT) has taken the ultimate power position in granting antitrust immunity between US and foreign airlines, which is unique to the airline sector. However, before DoT makes the decision on immunity approval, it receive recommendations from U.S. Department of Justice (DoJ), investigating the alliance on potential antitrust violations. KLM/NW was the first alliance granted antitrust immunity by the DoT in 1992, soon after the Netherlands and and the U.S. signed an opens skies agreement. These agreements govern airlines ability to operate specific international routes, dictating boundaries when making strategic decisions on carrying passengers on international routes. For example, open skies agreements constraint airlines from flying inside foreign countries borders, which in turn hinder cross-boarder mergers or takeovers, making alliance formation the “second best choice”.

The interest in competitive consequences from alliance formation and regulatory scrutiny stems from fundamental concerns about carrier and passenger welfare. There are both costs and benefits associated with alliances, generally classified into parallel and complementarity alliances. The later refers to two carriers linking up networks to feed traffic to each other, while the former a collaboration where two airlines, prior to alliance were competing on some routes. Therefore, two typical alliance structures are studied in this thesis: complementary and parallel. Moreover, since an alliance structure tend to be monopolistic, duopolistic or oligopolistic in the non-stop flight segment, this thesis attempts to find evidence explaining passenger output development that may support industrial organisation theory.

The issue of alliance formation is of current concern as the European Commission recently launched antitrust probe for anti-competitive practice of airline alliances. One inquiry concerns existing and planned cooperation between Star Alliance members United Airlines and Lufthansa.

The second involves proposed cooperation between members of the One World Alliance group, namely British Airways, American Airlines, and Iberia. The scrutiny stems from the fundamental passenger welfare concerns. Therefore, when alliances are allowed legal collusion it has to benefit consumers.

This thesis studies four different alliances aiming to show whether code-sharing and antitrust immunity increases passenger levels in the post alliance situation. The four alliances are Lufthansa/United Airlines, KLM/Northwest Airline, British Airways/USAir, and Finnair/American Airlines². Specifically, using panel data from the 1989-2007 period, this paper attempts to explore the following issues: First, whether code-sharing and antitrust immunity contribute positive output levels for each of the four investigated alliances. Second, the possible indications implying that post-alliance route concentration causes concern. Finally, a formal assessment on whether code-sharing and antitrust immunity generally improve welfare is conducted.

Estimated output effect, consistent with previous literature, shows that code-sharing is associated with increasing passenger levels. However, showing that results depend on statistical test characteristics, this thesis questions the validity of the positive code-sharing effect when controlling aggregated traffic output for airline- and route-specific levels. Yet, considering the limited data and error structures, which most likely influence the econometric equation, the thesis suggests that results be taken with due consideration. Nevertheless, valid results and important considerations are contributed as follows.

Statistical tests that traffic increases as a result of immunized alliances are found significant, providing additional evidence that immunity grants convey positive attributes. Therefore, this thesis finds it legitimate to suggest that antitrust immunity grants, for these alliances, proved to be justifiable from an authority perspective. Furthermore, this thesis finds intriguing results related to alliance formation; first, using total traffic levels as the dependent variable, traffic levels on parallel routes appears to increase. However, controlling aggregated traffic levels for carrier- and route-specific “market shares” as a dependent variable, results suggest quite the opposite. Albeit, expectations that parallel alliance decrease traffic are inconclusive. Second, the performed constructive estimation indicate that granting antitrust immunity to Lufthansa and United Airlines may not have been Pareto optimal on specific routes. To conclusively support this claim further analysis with more specific data is considered as an avenue for this research. Indeed, this

² Finnair and American Airlines are not used in the regression as the traffic volumes of Finnair on the North Atlantic market is far less than that of the “global connector” airlines’.

consideration raises an interesting consideration, namely, whether alliance formation drive individual carriers to seek for their strategic partners in order to defend market shares and profits.

Finally, investigating airline conduct in monopoly structures, this thesis argue that by restricting code-sharing output growth, airlines may use code-sharing as a tool for achieving greater yields and load factors at the same time.

1.1 Aim of the research

- I. This paper investigate effects of code-sharing and antitrust immunity on passenger output. Specifically, does code-sharing increase passenger output, and does antitrust immunity spur that effect?

- II. This research gathered original data on passenger levels in specific EU-US gateway markets. With this data, this paper analyse traffic levels comparing alliance and non-alliance output.

In addition, the following observations are contemplated. First, the possibility of using code-sharing and antitrust immunity in monopoly structures to increase yields in the interhub market by holding back on code-share capacity growth. In addition, how empirical findings in this research support theoretical predictions concerning monopoly and oligopoly. Finally, this paper argues that empirical results conceivably depend on the methodological approach.

1.2 The organisation of the paper

The next section presents literature on alliance formation, and the effect of code-sharing and antitrust immunity. Subsequently, this thesis continue with section three defining common airline terms used in this paper. It describes background of the airline industry, and explains the general competition platform in operational alliance structures. Section four analyse theoretical frame by conveying Industrial Organisation literature with respect to the airline industry. The fifth section continues by presenting code-sharing and antitrust immunity in theoretical frame, explaining underlying fundamentals of why both code-sharing and antitrust immunity may be considered as pro- competitive, and welfare increasing. This highly correlates vertical integration theory, and explains more precisely how complementarity by partnership commitment eliminates the double-marginalisation. The sixth section illustrates trans-Atlantic models in the airline specific networks structures. This is the elemental platform for the empirical research part. Data gathering and

methodology specification are presented in the seventh section. The descriptive part discusses concerns stemming from data-processing, and illustrate structural estimations on traffic changes during pre-and post-alliance periods. The eight section presents econometric issues considering pane data structures. First, it deals with statistical issues regarding the methodological approach and subsequently forms the regression model. Section nine presents received empirical results. The tenth section discusses issues related to research outcomes. Section eleven concludes this thesis.

2 Literature review

Before the 21th century, the literature on airline alliances were quite sparse. However, during the first decade of 2000 economists and scholars found some interesting results concerning code-sharing and strategic alliances. The bulk of research covers both theoretical and empirical work. Among theoretical findings Park (1997) investigate complementary and parallel alliance on fares, profit, output and welfare. He shows that welfare increases in the complementary network. In contrast, the parallel decrease welfare. Park and Zhang (1998) examine effects of airline alliance on partners' output by comparing outcomes of alliance and non-alliance. The authors find that the alliance leads to greater passenger levels for the partner's segment between gateway cities i.e. in the partner alliance hub-to-hub network. This increasing effect is mostly induced as the partner links more routes to the gateway city (spoke-to- hub). Park, Zhang and Zhang (2001) made empirical tests, based on theoretical frame, investigating complement and parallel routes utilizing trans-Atlantic data covering the 1990-1994 period. Results show that complementary alliance is likely to increase total output and parallel alliance is expected to decrease it. The quantitative analysis indicates an average of 11-17% increase in output in complementary networks, whereas parallel alliance decrease total traffic by an average of 11-15%³. The findings in Park et al. (2001) triggered an interesting question, namely, a sequential game settings among players.

Brueckner (2001), developed an oligopolistic model in Cournot fashion to show that the positive impact of code-share agreements on interline passengers likely outweigh any negative implications on the non-stop, interhub passenger (effect on traffic levels, fares, and welfare). Brueckner (2002) extended his former analysis with an application to the Star alliance on three measures of cooperation: alliance membership, code-sharing, and antitrust immunity. His results indicate that

3 The managerial implications of the study suggest that: 1) Whether the partner carriers is a parallel or complementary alliance they increase profits. The complementary alliance enables the airlines to increase the level of service to their customers, and the parallel alliance enables the alliance to reduce operating costs through committing into joint operations. The investigation further analyse that the the complementary alliance, in particularly, can have an adverse effect on non-partner firm's traffic. This occur because part of the profit gains of the alliance formation results from decrease in the output of non-partner airlines.

the total effect of these three forms lead to a substantial 27% reduction in interline fares.

The resulting aggregated benefit of abandoning the right to integrate activities can be approached by considering how much would passengers loose in total if these measures of cooperation were not present. The consequence of fare increase would induce the effect that some passengers chooses not to travel due to higher costs, while the remaining passengers end up paying a higher fare. In order to quantify the effect of what is referred as “consumer surplus”, Brueckner and Whalen (1998) made such calculations using data for 1997 period. Authors came to the conclusion that negative externality arises from uncoordinated choice of interline sub-fares in the absence of alliance. The results show that alliance partners charge interline fares that are 18-28% below those charged by non-allied carriers. In addition, they found that alliance between two previously competitive carriers increases fares by 4-6% in their parallel hub-to-hub network, thus, this anti-competitive effect was found statistically insignificant.

Bilotkach (2004) departs from Cournot settings and analyses international alliances from a price-setting, Bertrand model. The analysis compares alliance price effects with and without antitrust immunity. The proposition behind the Cournot model is that in order to completely remove double marginalisation (in vertically integrated firms) alliance need antitrust immunity. Bilotkach (2004) argues that alliances with antitrust immunity do not benefit interline passengers more than those without immunity. In both Bertrand and Cournot setting the models agree on the fact that antitrust immunity increases fares and decrease non-stop passenger levels in the parallel, hub-to-hub segments.

Brueckner and Whalen (2000) made an empirical duopoly-pair alliance investigation on price effect pre-and post agreement on code-sharing. Authors findings show that non-alliance interline pricing are affected by double-marginalisation, which is internalized in the code-sharing alliance case. Further, authors show that alliances are associated with significantly lower fares for the interline passenger with respect to non-alliance interlining. Whalen (2007) extend that analysis through the use of 11-years of panel data on international traffic between the U.S. and Europe (third quarter of every year between 1990-2000). He found that alliances with antitrust immunity are associated with fares 13% to 20% lower than traditional interline fares, and code-sharing fares are 5% to 9% lower. Subsequently, the estimated output effects from immunized alliances are associated with 51–77% higher output and code-sharing output is found 29–41% higher.

3 Definitions and regulatory framework for airline alliances

This section defines key elements considering the frame for alliance operational structures. A narration on airline conduct from the regulatory perspective is presented. These definitions and concerns are all code-sharing and antitrust immunity related. The aim is to provide an overview of the environment affecting the airline industry in context of code-sharing as a tool for achieving large scale marketing benefits.

3.1 Code-Sharing

Even though most people dislike changing aircraft traveling from origin to destinations, it remains impossible for everyone to fly non-stop. Often travelers switch aircraft at a hub airport e.g. flying with Finnair from Helsinki (HEL) to Los Angeles (LAX), one switches plane in New York (JFK). This New York-Los Angeles flight are often operated by another airline, e.g. American Airlines. If this described ticket HEL-JFK-LAX was sold as a Finnair ticket, but operated by Finnair from Helsinki to New York and from New York to Los Angeles by American Airlines, then there exists a code-share agreement between JFK-LAX with Finnair and American Airlines. The key feature of code-sharing allows partner airlines to issue one ticket instead of two separate tickets.

Usually the term code-share is explained as allowing an other airline to use its code when it sells seats on a partner's plane on a specific route. This is a cooperative service agreement between the two carriers. Furthermore, it implies that passengers buying tickets from one airline using that airline's flight number system, may end up sitting in an aircraft operated by a different airline. The basic idea behind code-sharing is that passengers consider the whole flight journey as flying with the same airline, though the operational service from origin to destination change between carriers. All code-share agreements, where computerized reservation systems (CRS) are merged between carriers, attempt to increase passenger value for traveling with the contracting airline firm.

An interesting statement by John M. Nannes⁴ explains the Antitrust Division analysis of International Aviation Agreements and their Antitrust Implications⁵. Nannes elucidate that the term "code-share" conceivably mean as little as one airline allowing another airline to use its computer reservation system codes to sell seats on its planes on routes in which the second airline cannot compete, or as much as comprehensive integration of marketing and operations that involves joint decisions on pricing, capacity, schedules and other competitively sensitive matters. Code-sharing

4 Deputy Assistant Attorney General Antitrust Division U.S. Department of Justice

5 The statement can be found for example under <http://www.usdoj.gov/atr/public/testimony/1755.htm>

has the possibility to represent a form of corporate integration that falls between a traditional arm's length interlining agreement and an outright merger. Nannes further explains that just as acquisitions and mergers, code-sharing arrangements are considerably pro- competitive, where the traveling public benefit from new services, improve existing services, lower costs and increase efficiency. Nevertheless, code-share agreements are frequently anti- competitive. Code-share agreements may result in market allocation, capacity limitations, higher fares, or foreclosure of rivals from markets, all to consumer disadvantage. For the aviation policy makers it is very important to distinguish the latter effect from the former.

From a public perspective, code-sharing enable passenger to travel with one ticket instead of two tickets, which indicates that the carrier which "plate" the ticket is issued (the carrier operating the first leg) is responsible for the passenger to reach the destination. This imply that e.g. in cases of delay, passengers do not have to purchase a new ticket (which would be the case on two ticket itinerary). In fact, the plating carrier is responsible for offering an alternative solution to carry passengers to their destination. Commonly, by issuing a single ticket on code-sharing itineraries baggage handling is organized so that the traveler only need to check in ones, at the origin, and the luggage is transferred to destination (there are some limitations on this matter), which increases convenience.

3.2 Airline Alliance

An airline alliance provides opportunities for the partner airline to take advantage by linking its network to the other partners network. By integrating existing networks it reduces costs, by taking advantage of serving new markets, thereby avoiding investments in new aircraft and hubs. On the other hand, an alliance between two significant competitors on an international route may adversely affect competition in certain markets.

An airline alliance is referred to agreements between two or more airlines. The degree of cooperation differs between alliances and are frequently described as strategic- or commercial in nature. Strategic alliances distinguish from ordinary alliances in that the partners in strategic alliance makes a more serious commitment in cooperation.

An alliance may, under certain circumstances, enter into comprehensive marketing cooperation, including code-sharing, frequent flyer benefits and lounge access rights, placing codes on city pairs by the other carrier. Moreover, an alliance enables cooperation on route and schedule planning,

advertising and marketing, pricing and yield management, revenue allocation, ground handling, cargo services, information technologies and distribution systems, and several other areas. All depending on alliance partner willingness and the degree of exemptions received from competition authorities.

Alliances evolved over the years, and during the 21th century the existence of alliances shows importance under pressure of fierce competition between airlines and rival alliances. Alliances enable the ability to concentrate and link activities and improve competitive advantage against smaller operators. The penetration of low cost airlines have also made the traditional “national” carriers to seek competition advantages (Doganis, 2002).

3.3 “Open Skies” and bilateral agreements

An important concept related to alliance formation is understanding the meaning of bilateral agreements. Bilateral agreements between countries dictate particular carriers ability to operate on specific international routes. Understanding bilateral agreements elucidate the distinctive boundaries carriers have when making operational strategies on carrying passengers. In addition, it reveals fundamentals behind reasons airlines are “forced” to make agreements and alliances with each other in order to provide better service to customers.

The term open skies refers to international aviation markets liberalization, minimizing government intervention. What started in the *Convention on International Civil Aviation* (1944) in Chicago was the so called *freedoms of the air*⁶. The intention of the treaty signed by member nations were entering into bilateral agreements that may grant rights or privileges to scheduled international carriers. It was argued that the airline industry had matured enough in order to face a competitive environment, where the marketplace decides on air fare levels.

The U.S. government independently began to develop bilateral agreements with one country at a time. These allowed U.S. airliners to land at particular cities in other countries for fuel, unload and board passengers. In addition, agreements allowed other countries’ airlines to land in American cities. The Open Skies Agreement recently developed so that the treaty allows U.S. airlines flying within Europe, so long as they do not fly between two points in any member state. On the other hand, European airlines do not have access to fly domestic U.S. segments. This caused concerns, as according to EU, European airlines would be at a comparative disadvantage with U.S. airlines

⁶ The freedoms of the air can be found in the Appendix A.

because of cabotage laws. This is somewhat clearer if one compares EU member nations to U.S. states. U.S. Airlines may fly between European nations, however, EU carriers are not allowed to operate between U.S. states. Nevertheless, EU airlines are allowed to operate direct flights between the United States and non-EU countries like Switzerland. The deal was signed in Washington D.C. on April 30, 2007⁷. Since the meeting, an agreement of a more consolidated Transatlantic Common Aviation Area was established. The recent development allow airlines and alliances to compete under more unified terms. For example, the current form of open skies agreement between the UK and the US, allows any European or US airline to fly between London Heathrow and US cities, enabling more competition between London and the U.S routes.

3.4 Antitrust immunity

Antitrust policy is described as Government's policy intended to control the actions of firms in pursuit of market power. When antitrust authorities decide whether or not to allow for antitrust immunity, they compare pros and cons of creating such competition advantage. Before the DoT makes decisions on restricting or granting antitrust immunity, they receive recommendations from DoJ, reviewing code-sharing proposals for potential antitrust violations. Nevertheless, DoT has taken the right to challenge any proposition by the DoJ. Therefore, DoT has the ultimate power in approving antitrust immunity.

Antitrust immunity should encourage more competitive service and increase welfare. According to airlines, antitrust immunity significantly improves customer choices and convenience, produce important operating efficiencies providing greater passenger and carrier value, while increasing competition with other alliances in thousands of city-pairs. Antitrust immunity is of vital strategic importance, helping remain competitive against other trans-Atlantic alliances that already have such immunity. Immunity allow airlines to act as if they were merged, implying that an alliance possessing immunity is able to set prices as if the connecting complementary trip was online (service with the same carrier). As a result, immunity makes it possible to price discriminate between connecting and non-stop passengers.

Under immunity, the alliance is able to cooperate on prices and volumes. Furthermore, it enables strategic coordination, develop mutual fare formulations in all markets, and quickly change fares according to market conditions. In principal, immunity permits enhanced integration without legal challenges from competitors. Thus, carriers are more or less able to operate as if they would be

⁷ A news release can be found under EU web address http://www.eurunion.org/eu/index.php?option=com_content&task=view&id=2936&Itemid=26

merged as a single airline. However, due to National-ownership restrictions each airline's management remains separate, even if carriers coordinate activities closely.

3.5 Code-Sharing and Antitrust immunity

Shortly after US and Netherlands signed open-skies agreement in September 1992 KLM/Northwest (later referred as KL/NW) became the first alliance granted antitrust immunity by the DoT in November 1992. Lufthansa/United Airlines alliance (later referred as LH/UA) was approved antitrust immunity by DoT in May 1996. Unlike the KL/NW alliance, LH/UA were neglected price coordination, inventory or pooling of revenues on Frankfurt-Chicago and Frankfurt- Washington gateways. These parallel routes remained subject to antitrust laws.

The One World flagship carriers British Airways (BA) and American Airlines (AA) have filed quite few attempts in creating an alliance permitting operations as a single carrier on trans-Atlantic routes. In 2002 carriers were not granted antitrust immunity on the basis that regulators feared that allowing BA/AA collaborate and set fares as a single airline would lead to reduced competition and higher fares in parallel networks between major U.S cities and London Heathrow airport (LHR). In addition, interpretation from authorities stated that both of these airlines control majority of the traffic between the concerned city- pairs. Furthermore, other alliances with antitrust immunity operate parallel routes, but traffic volumes are far less than that between the popular US-UK routes jointly served by AA and BA. The authority conduct is rationalized by relying on previous studies on the negative impact of parallel alliances. However, there exists only few parallel alliances on the trans-Atlantic market in order to make a robust comparison between the positive and negative attributes. The earlier empirical parallel alliance data has grounded mostly on Delta Airlines (DL) and Sabena (SN) route networks (Zurich-US)⁸. Accordingly, the empirical negative effect is drawn from the case of DL/SN. Several changes has developed after this alliance. For example, Sabena has not existed after filing for bankruptcy in 2001. Moreover, most research data has only covered the period of 1990-1994. Accordingly, these considerations do not necessarily depict the current market outcome when referred to parallel alliances. Therefore, a legitimate proposition is suggested, namely, that the effect of a parallel alliance needs re-evaluation based on more recent data. In addition, theoretical investigations backing up the empirical work mainly consider duopoly parallel networks. For producing a more profound investigation, applicable in the case of BA/AA, parallel alliances facing competition in oligopoly route structures needs to be considered.

8 See for example Park and Zhang (1998) and/or Park, Zhang and Zhang (2001)

Indeed, the dread of reduced competition in cases of parallelism, in the BA/AA case, transpire to be controversial when looking at the market data figures released recently. BA and AA face intense competition from other airlines serving routes on the trans-Atlantic market. Figure 1 depict total yearly aggregated traffic departures of BA and AA compared to combined departures of rival carriers on four different U.S. cities connected to London. The illustration shows that before mid 1990, the main U.S. routes connected to London were highly dominated by AA and BA. However, a shift initiates after 1995, when BA and AA rivals' market shares, measured as departures, soared compared to BA/AA. For example, between 1995-2000, BA/AA and rival airline departures rose dramatically by 1900 and 3000, respectively.

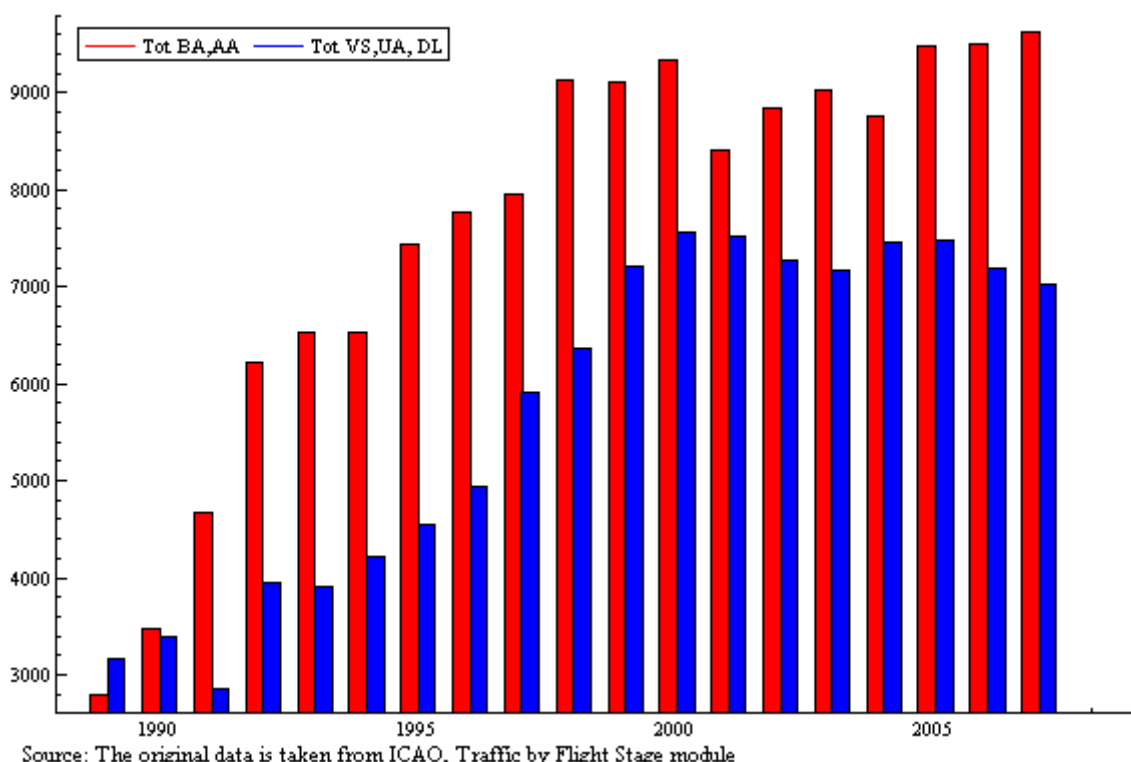


Figure 1: Combined aggregated departures between UK and US by AA and BA compared with total combined departures of VS, DL, UA, during the period of 1989-2007. City pairs used in the figure are London-New York, London-Chicago, London-Washington DC, London-Miami, London-Atlanta

The recent move, in 2008, where BA/AA seeks antitrust clearance to coordinate prices, capacity, schedules and routes, and share revenue on flights between Europe and North America, marks the third bid since 1996, when BA and AA filed for attempts for strategic co-ordination. Since the second attempt receiving antitrust immunity, London Heathrow has been opened to other airlines through open skies agreements where any European and American airline have the opportunity to

fly between Heathrow and U.S. cities. Even though BA and AA only holds a 43,6% overall market share on flights from Heathrow to the US, the co-ordination rights are rejected. The greatest market shares appears between JFK-LHR where BA/AA has 52,2% (Virgin Atlantic (VS) claim that the two airlines would have nearly 60% of passengers between the United States and Heathrow, and up to 79% of the seats on some routes)⁹. It remains interesting that flag ship alliance carriers LH and UA of Star Alliance and the SkyTeam alliance of AF and DL have 76% of U.S. service from Frankfurt, respectively for AF/DL a 63% of U.S. service from Paris. This consideration questions the impartiality when neglecting BA/AA the antitrust immunity rights. Nevertheless, reasons backing up BA/AA integration disapproval is presented earlier i.e. AA and BA operate majority of traffic in many city-pairs between London Heathrow and US cities. In addition, as explained previously, a mandatory requirement for antitrust immunity approval is establishing a bilateral open skies agreement. The U.S. and U.K. had not negotiated open skies agreements before late 2007, which since then have been achieved.

Currently, it seems clear that there are no sustainable evidence holding back the fact that BA and AA are worthy to get antitrust immunity. This in order to be competitive with other European and American alliances. Antitrust immunity boosts sales and eliminates duplication, helping AA/BA blunt higher fuel prices and grab market share from Air France-KLM and Delta Airlines, which received immunity in April 2008. As BA chief executive, Willie Walls informs, the alliance leads to schedule coordination and give travelers more destinations and easier flight connections¹⁰.

Figure 2 shows the airline alliance formation development from 1978, when Airline Deregulation pact partially shifted control over air travel from the political to the market sphere.

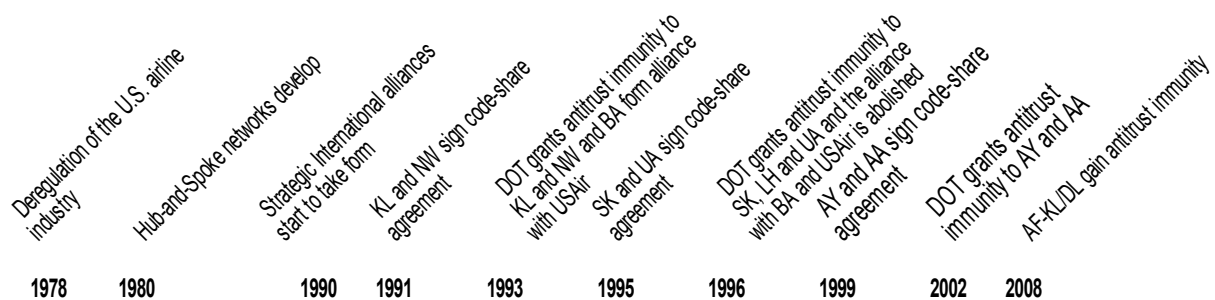


Figure 2: Airline Alliance formation timeline

9 The estimated market data is from July 2008, and the information is based on an interview with Don Casey, managing director for international planning at American by Herald Tribune on the September 3, 2008. See full article at <http://www.iht.com/articles/2008/09/03/business/air.php>

10 See interview by Steve Rothwell and Mary Schlangenstein in Bloomberg.com, August 14, 2008. <http://www.bloomberg.com/apps/news?pid=20601102&sid=a1zyyzRBKVBg&refer=uk>

3.6 Competition Authorities

The airline industry still remains one of the most regulated and restrictive industries in international trade. Airlines operate across the globe following policies stipulated in Governmental competition laws and regulations. Therefore, this section focuses on bringing forth the various procedures for cooperation approval under EC competition laws and US antitrust laws.

Competition authorities engage in concerns relating to legislative initiatives aimed at protecting trade and commerce from monopolistic business practices that restrict or eliminate competition. Thus, antitrust laws attempt to control cooperation and cartels constraining corporations from employing monopolistic practices and making unfair profits.

In many respects, alliance involving code-sharing remains highly divisive. The main concern when airlines jointly manage schedules, capacity, pricing and revenues, associates with reduced competition on some routes. The US Department of Justice (DoJ) approaches by looking at potential threats an alliance possesses. Every alliance is considered on a case by case basis where the analysis consists of same principals as the consideration of a **Horizontal Merger**. Traditionally code-sharing has been accepted by the regulators on both sides of the Atlantic, as certain amount of cooperation brings increased consumer benefit. However, immunity is not approved unless there are clear passenger benefits. If the proposed alliance is expected to cause anti-competitive effects, authorities tend to impose conditions on it, or prohibit it altogether. As already mentioned, DoJ reviews the alliance, yet, DoT has the right to challenge any approval by the DoJ. Hence, DoT retains the ultimate power in granting antitrust immunity, which is unique to the airline sector.

Unlike the US authorities active participation in applying competition laws to alliance formation between US and European airlines, the European Commission (EC) remained relatively quiet until the proposed alliance between BA and AA. The proposed alliance between BA/AA was first announced in June 1996. The alliance would have given the pair 64% of all seats between London Heathrow and the US, and monopoly on a number of very important routes (Oum et al., 2001). This raised concerns and prompted the EC paying closer attention to antitrust implications of proposed alliances. The authorities feared that BA/AA alliance would be too powerful, resulting in market allocations, possibly impairing consumers.

One of the concerns raised by the EC is that the US has used alliance and antitrust immunity to sign “opens skies” agreements with its member states. This provides advantage for US airlines over EU

airlines. It appears that an opens skies agreement is a mandatory requisite for the US to approve antitrust immunity (Oum et al., 2001).

3.6.1 Sherman Act¹¹

The oldest U.S. Antitrust law is called Sherman Antitrust Act, founded in order to limit cartels and monopolies. Through Sherman act, US government take action in preventing price-fixing agreements and makes tacit collusive illegal. It contains stipulations considering mergers, acquisition, and agreements which sole purpose is to reduce competition. Under Sherman Act, competition authorities monitor any agreements that negatively impact consumers, business competition, and general welfare.

When airlines seek for antitrust immunity, US laws places the burden of proof for approval on applicants. In order for the transaction to proceed, the statement from applicant(s) needs to explain the reasons for immunity being in the public best interest and necessary. Basically, Sherman Act is a federal law ending restraints or approving trade between the domestic states, or with foreign nations.

3.6.2 Article 81 and 82¹²

Unlike the US Transportation Department, which has jurisdiction over airline antitrust in the US, the EU does not issue grants of immunity. Rather, it looks into proposed partnerships and opposes them or lets them move ahead. The European competition law are based on Article 81 and 82 of EC Treaty, outlining the primary framework for regulation of competition in the EU. These articles maintain fair competition between European markets. Article 81 generally prohibits actions by undertakings which might affect trade between member states. Article 81 forbids agreements between parties that strives for practices that have as object or effect the prevention, restriction or distortion of competition within the common market. The Article is applied to both horizontal competition restraints (cartels) and vertical agreements such as distribution agreements. The prohibited restraints include price-fixing between competitors, agreements on production quotas or market sharing. Under Article 81(3), however, the provisions are inapplicable if the benefits override anti-competitive impacts. The prohibited agreements are beneficial for competition if they boost production or increase distribution of goods or promote technical or economic progress and if

11 Manual for the antitrust laws: <http://www.usdoj.gov/atr/foia/divisionmanual/two.htm#a3>

12 Some good guideline for carrying out EU Competition Rules of article 81 and 82 can be found under Finnish Competition Authorities website: <http://www.kilpailuvirasto.fi/cgi-bin/english.cgi?luku=ec-competition-rules&sivu=ec-competition-rules#2>

consumers are considered to benefit from the agreements. Article 82 outlines the dominant position doctrine. It forms the core of regulations concerned with abuse of dominant position. Four activities in particular are concerned under Article 82; *price discrimination, production or technical development limitations, application of dissimilar conditions to equivalent transactions and tying arrangements*.

On the 20th of April 2009 the EU launched antitrust investigation against seven different airlines within the Star and One World alliances. This was done, specifically, examining their trans-Atlantic operations. The focus in the investigation is not on the ticket prices *per se*, but rather on the cooperation level, primarily, between BA/AA and LH/UA.

European Commission spokesman Jonathan Todd told reporters that the level of cooperation among these airlines appears far more extensive on the North Atlantic market than the general cooperation between these airlines and other airlines that are part of the Star and One world group, respectively. Todd said that issues such as schedules, capacity, and pricing were central to the probes. The commission intend to determine whether these airlines have colluded illegally on certain routes failing to comply EU rules prohibiting restrictive business practice, specifically Article 81 of the EC treaty. Todd further stressed that even if the DoT granted antitrust immunity to BA/AA, the tie-up has to follow article 81 of EC treaty. "The law says companies cannot collude on things like prices and services unless there are clear benefits for consumers", Todd argued¹³.

The authorities need to identify the actual competitor as well as the restraints of trade, the definition of the "relevant market" that is the most important consideration when evaluating anti-competitive effects. Thereby, when different competition laws are applied, relevant market definitions given by different authorities tend to conflict with each other. Both European and United States antitrust authorities apply competition laws to trans-Atlantic alliances. When both authorities have developed their own relevant market definitions, inconsistencies with regards to alliance formation and exemptions they receive often arise. Furthermore, there seems to exist defects in consensus between respective authorities. This makes it difficult for airlines, specially BA/AA, making proper antitrust immunity application documents. As EC launched a probe on the 20.4.2009 against BA/AA, it prolongs approval of immunity. It might take up to two years before the scrutiny settles up on assessment. This is deemed to be unfair, considering that BA/AA is the only flag ship carriers in a global alliance that can not coordinate activities and remain competitive against those already

13 See, <http://www.telegraph.co.uk/finance/newsbysector/transport/5189914/European-Commission-adds-to-turbulence-over-BAAA-tie-up.html>

recognized with immunity.

3.6.3 Market power and dominant position¹⁴

Another important aspect considering EU competition laws and US antitrust laws applicable to air transport industry and alliance formation, is the definition of market power. Usually, a carrier's market power is defined by its market share. The range of market share to determine market power differs from case to case. By and large monopoly power has been considered in cases where the operator has fifty or greater per cent of market share. However, there exist rulings where dominant position has been concluded in cases where undertaking's market share is below fifty per cent. The consideration and the dominant position criterion differs between the US and the EU. Therefore, situations could occur where one of the antitrust authorities considers a carrier to have a dominant position, whereas the other authority delivers the opposite ruling.

When European Commission decides whether or not to approve alliance formation, they seem to use the market share criterion. The commission obligated alliance partners to release 55% of the hub-to-hub route weekly departures to competitors. However, this criterion was not carried out in the LH/UA case and the KLM/NW alliance.

In contrast to the EC, the US authorities apply both the market share and the market power criterion when they decide whether to allow or restrict alliances. The US DoT uses the percentage of market share of alliance partners and Herfindahl-Hirschman index ("HHI") to measure the size of the partner alliance in relation to competitors in a specific market, where it indicates competition level among alliance partners and their rivals. As a result, the different evaluation systems on market concentration causes conflicting rulings between antitrust authorities when applying competition laws to international alliances on both sides of the Atlantic. Thereby, individual airlines and alliances crave for consensus on definitions when antitrust authorities, on both sides of the Atlantic, apply competition laws to alliance formation. Unity among authorities assist airlines dealing with different applications when seeking antitrust exemptions.

3.7 IATA (*International Air Transport Association*)

Frequently, airlines tend to be enticed to collusive behavior in order to fix the price above-equilibrium level i.e. above market price and transfer some of the consumer surplus to airlines that collude. Price fixing is illegal between airlines (unless they have been granted a special exemption).

¹⁴ Most of the information in this subsection is received from section 3 in Lu (2003).

Actual fares are established by the International Air Transport Association (IATA). IATA has the price-fixing power. The fares are created using algorithms including procedures for making adjustments as market conditions change, rather than specific market price. Some fares are set up according to flight distance or according to the fully flexible fare on each route. The main objective of the organisation is to assist airline companies to achieve lawful competition and uniformity in prices. IATA's mission is to represent, lead and serve the airline industry. Its members are currently above 240 airlines around the world¹⁵.

The basic idea behind IATA fares is that, in non-alliance interlining, fares are divided between carriers according to a distance based "pro rating" formula. The fares are set in IATA conferences or through direct negotiations. Under this IATA pricing model, each airline chooses its own "subfare" for its part of the route, and takes the other airlines "sub fares" as parametric in Cournot style. Carriers are not obligated to charge the conference fare. However, they are required to compensate the other airline as if the conference price was charged. Code-sharing often results in lower prices, because it gives possibilities of circumventing IATA fares and set individualized prices (Whalen 2007).

4 Common Theory in Industrial organisation literature

This research section presents theoretical frame for the thesis. Although theoretical issues are to some extent extreme market outcomes, they provide some useful points of reference. Indeed, empirical observations often suggest that the real-world markets are somewhere between the extremes (Cabral 2000). Therefore, industrial organisation theory is presented first and subsequently a structural estimation analysis is performed in order to compare empirics to theoretical predictions.

4.1 Monopolistic and monopoly markets

Monopoly is a imperfect market condition where pricing behavior implies allocative inefficiency. The monopolist produces where marginal revenue (MR) equals marginal cost, as illustrated in figure 3. The price p^m set by a monopoly firm is higher than its marginal cost. The output q^m is set at a lower level than the optimal output q^c (considered under perfect competition). Measuring the loss of social welfare in figure 3, we compare the total surplus under monopoly price with that at the marginal cost price (competitive price). The sum of consumer surplus and the producer surplus (profit) is equal total surplus. From figure 3, total surplus is the area **ADGA** under

¹⁵ <http://www.iata.org/about/mission.htm>

marginal cost pricing, and under monopoly pricing the total surplus is the area **ADEFA**. The consumer surplus is depicted as the area **CDE** under monopoly pricing, and monopoly profits is equal the area **ACEFA**. The welfare loss is equal **EGFE**. In contrast to perfect competition, a firm exercising monopoly power over a given market can raise its price above marginal cost without losing all its clients (Tirole, 1988).

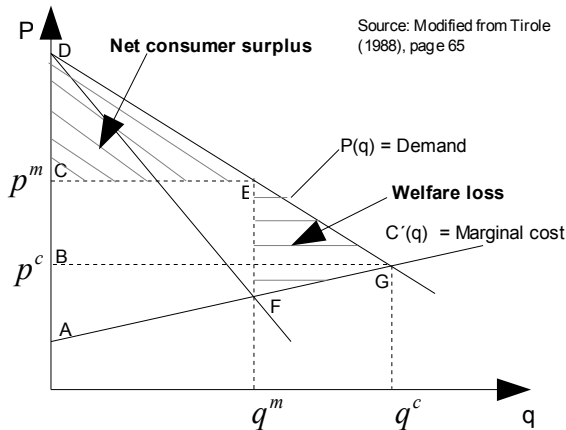


Figure 3: Pricing characteristics and output outcome under monopoly and perfect competition

The common characteristic of monopoly and perfect competition is that each firm does not have to worry about rival reactions. This is trivial in monopoly as there are no rivals (Cabral, 2000).

Carriers may have monopoly in specific non-stop segments. However, usually the same origin and destination are provided by more than one carrier. Nevertheless, as “others” except the monopoly carrier fly by connecting cities it imposes inconvenience, assuming that the passenger prefers fewer stops on an itinerary. Then, the market could be seen as monopolistic where the only factor which distinguishes perfect competition and monopoly is that of product homogeneity. Consider it this way, AY is the monopoly supplier of the non-stop service between Helsinki (HEL) and New York (JFK). However, calling AY a monopolist on the market HEL-NYC would be an artifact of a very contrived market definition. It would be more striking considering the market in aggregated levels i.e. all the flight itineraries with origin HEL and destination JFK. This includes both non-stop and connecting service. Thus, flying SAS from Helsinki to New York connecting either in Stockholm or Copenhagen should also be considered.

Nonetheless, this paper’s empirical part concentrates in finding evidence on monopolistic behavior. AY has 100% of market share on non-stop flights between HEL-JFK-HEL. However, are they

likely to exercise monopoly power? It is important to distinguish between monopoly market share and monopoly power. In fact, outcomes of monopoly power or a dominant market position could lead to inefficiency, welfare loss, or predatory pricing behavior.

4.2 Oligopolistic market

In theory, duopoly markets refers to a market structure where one would expect the price and quantity level to be somewhere between the two extremes of perfect competition and monopoly. Thereby, duopoly may represent an intermediate level between markets characterized by minimum market shares (perfect competition) and maximum concentration of market shares (monopoly). Thus, arises the question whether airlines operating a duopoly/oligopoly network markets structure behave differently when deciding on quantity/passenger levels from that of monopoly or perfect competition.

An important characteristic of oligopolies in contrast from the extreme of monopoly is the strategic interdependence between competitors; an action on price or volume decision of firm 1 is likely to influence firm 2's profits, and vice versa. When firm 1 makes decisions it should take into account the decision processes of firm 2 i.e. firm 1 should consider how its decision impacts firm 2's profits, and specifically how it expects firm 2 to react. The models that characterize the process of interdependent strategic decision making under oligopoly is usually divided into the Bertrand model and the Cournot model. More generally, the game of quantity (Cournot) and price (Bertrand) competition, is set in a way that the pay off of one firm is not only dependent on its own decision, but also on the decision of the other firm(s). Typically these player matrixes are modeled under strategic behavior where one player considers that the action taken now, have an impact on the the other players' action in the future. The rule in these games are that both choose their strategies simultaneously (Varian, 1992).

4.2.1 Bertrand and Cournot outcomes

When studying firm strategy, mainly in competition or interaction between few firms in market characterized of oligopoly, findings show that the airline industry can be modeled both in quantity- and price-setting structures.

Before making pricing decisions, airlines generally choose simultaneously output levels in Cournot fashion (Tirole, 1998). It is easier for airlines to change price than to change output levels¹⁶. Thus,

¹⁶ It is not necessarily easy to get new slots at congested airports, or there could be capacity constraint that need to be considered.

prices are set at levels where demand equals the total quantity produced by both firms. For each pair of output choices (q_1, q_2) , equilibrium prices will then be $p_1 = p_2 = P(q_1 + q_2)$, with total cost function $c_i(q_i)$. Accordingly, profits for firm 1 is give by $\pi_1(q_1, q_2) = P(q_1 + q_2)q_1 - c_1(q_1)$, assuming constant marginal cost¹⁷.

If we compare the two duopoly outcomes, in general, Cournot model predicts that price under duopoly is lower than under monopoly, but higher than under perfect competition. In contrast, the Bertrand model suggests that duopoly competition is sufficient enough to drive price down to marginal cost i.e. the perfect competition price levels are achieved, and the market is thus characterized by constant returns to scale. The basic Bertrand model consists of two homogeneous products and the assumption is that both firms set price at the same time (Cabral 2000).

Which one, Bertrand conduct or Cournot strategy, is the more realistic model considering code-sharing in aviation? Keeping in mind that theory presents fundamentals concerning firm conduct, and the fact that industries differ, it may be relatively legitimate to state that during the first stage, or let us say period 1, the airlines enter into Cournot competition, and in period 2 the carriers conduct strategies in Bertrand fashion. As a result, the long run variable equals the capacity or output decision, and subsequently prices being set in the short run.

The literature has investigated code-share agreement both assuming Cournot and Bertrand competition, respectively. Under Bertrand competition findings show that competition between alliances with antitrust immunity may end up with lower fares for the connecting passenger, due to removal of double-mark up. However, antitrust immunity does not increase additional benefit (compared to code-sharing) for connecting passengers. Yet, the fares for interhub (hub-to-hub) increases, since airlines can mutually coordinate on price-setting (Bilotkach, 2004). Bilotkach showed in his two rival alliance competing Bertrand model, that antitrust immunity was not necessary for the complete removal of double marginalisation, something that was previous suggested by Cournot models (Brueckner 2000). The Cournot model shows that in order to completely remove the problem of double marginalisation for connecting trips, antitrust immunity was necessary. The driving force for Bilotkach's statement of why the airline market can be applied into Bertrand fashion, is that those suggesting that Bertrand type of competition is not a long-run equilibrium in a hub-and-spoke network, do not consider multi-hub network. Neither do they consider the fact that price competition can be characterized in a market where airlines take

¹⁷ First order condition and second order condition can be found in for example Cabral (2000), p. 79

advantage of economies of density¹⁸. Furthermore, Bilotkach (2004) argue that the Bertrand model allows for formal comparison of price effects of airline alliances with and without antitrust immunity. He further states that this has only been addressed indirectly in the Cournot-type models. Finally, he explains that we can observe rather narrow profit margins in the industry. This is not consistent with the Cournot-type of competition. By en large, the only theoretical difference Bilotkach (2004) found in his alliance competition model compared to previous Cournot investigation of Brueckner (2001) was that passengers do not get any extra gain from antitrust immunity compared to code-sharing. Nevertheless, there exists some controversy between the outcomes using Cournot vs Bertrand settings.

4.3 Code-sharing in parallel networks

In parallel structures the two airlines compete in the same route and sign a code-sharing agreement. The operational service of the airlines can be considered to be substitutes, as they provide basically the same service. Thus, passengers may choose flying with either one of the carriers. This type of code-sharing has the potential of weakening competition between the two carriers. If airlines are allowed to cooperate on parallel routes, they do not compete directly against each other. In fact, they share codes for the same flights facilitating partners to pool revenues, departures and services. Research show that by en large passengers traveling on parallel, non-stop, network are price-discriminated against connecting passengers at a hub airports (this is because airlines with code-share agreement can distinguish between passengers on an connecting-and non-stop itinerary). Fares on parallel network tend to increase whereas the connecting passenger can enjoy reduced fares over hub-and-spoke segments. According to Bilotkach (2004) the extent of price increase on the parallel route depends whether the alliance have antitrust immunity or not. Calculations done by Brueckner and Whalen (1998) show that over the horizontal hub-to-hub- network, where carriers become alliance partners, fares rise by 5% compared to the pre-alliance stage (this effect, however, was not found significant). Moreover, total traffic are expected to decrease by an average of 11-15% of the average total traffic due to a parallel alliance (Park et al., 2001).

4.4 Code-sharing in complementary networks

In economics, complements are goods consumed together. This imply that if goods A and B are complements, more of good A being bought would result in more of good B also being bought. This gives a good example on how complementarity can be illustrated in code-sharing networks. When

¹⁸ Economies of traffic density is present in the airline industry when cost per passenger seat declines with aircraft size.

referring to complementary alliance networks, I consider markets of two hub airports, one in each country and respectively the scopes that are connected to these hubs. Neither of the partner carriers operate in the domestic market of the other airline. Therefore, the national carrier can not offer the passenger a connecting service from the city of origin to a scope in a second country i.e. city of destination. Thus, code-sharing agreements come in hand. If, in the LH and UA alliance case, passengers purchase a ticket from from LH which include the code-sharing segment operated by UA, the passenger also have to purchase the service operated by LH (the interhub segment). Consequently, the demand for operational service of LH soars as the demand for code-sharing with UA increases. This is the form of a perfect complement where one good has to be consumed with another good.

There exists some fundamental reasons for this integration behavior. For example, who carry the responsibility if the connecting flight is delayed? Commonly, under code-sharing agreements passengers are protected for delays and cancellations by the carrier that sold the two segment ticket. Moreover, code-sharing agreements have the advantage for passengers via check-inn procedures and baggage handling. Passenger only have to check inn once, and baggage are transferred all the way to final destinations. Usually FFPs are also integrated in the code-sharing agreement.

After looking at the formal passenger gain from code-share arrangement, we can model some characteristics considered from the alliance point of view.

A complimentary alliance, as in the LH/UA case on for example the FRA-JFK route, represents strategic advantage enabling partners committing credibly to greater output by achieving extensive operating networks. Thus, allowing LH/UA connecting networks may increase customer service and quality, take advantage of product complementarities, and realize economies of scale and scope. This may be formulated with two firms in a model as follows:

$$p^i = p^i(q_1, q_2) \tag{1}$$

with

$$p_2^1(Q) > 0, p_1^2(Q) > 0 \tag{2}$$

where p indicate price and q display quantity

In equation (2), $Q \equiv (q_1, q_2)$ denotes output vectors and the subscripts denote the partial derivatives. For example $p_2^1(Q) \equiv \partial p^1(Q) / \partial q_2$ which is the demand complementarity between 1 and 2. With the cost function $c_i(q_i)$ the model yields profit functions for both firms,

$$\pi^i(Q) = q_i p^i(Q) - c_i(q_i), i = 1, 2, \quad (3)$$

similar to Cournot fashion with the condition

$$\pi_2^1(Q) > 0, \pi_1^2(Q) > 0 \quad (4)$$

since $\pi_2^1(Q) \equiv \partial \pi^1(Q) / \partial q_2 = q_1 p_2^1$

This suggests that increasing output of firm 2, increases the profit of firm 1 and vice versa. Therefore, the following assumption may be made: increasing output of firm 2 raises the marginal profit of firm 1, and vice versa i.e.

$$\pi_{12}^1(Q) > 0, \pi_{21}^2(Q) > 0 \quad (5)$$

which indicates that goods 1 and 2 are strategic complements.

Indeed, Cournot models consider competition, and therefore disallows from making a perfect comparison into structures characterized of complementarity. However, Zhang and Zhang (2005) use the above structured model in a set of two pairs of complementary alliances i.e. four firms where they analyse the subgame perfect equilibrium of the alliance game. The first proposition of Zhang and Zhang (2005) suggests that complementary alliance strengthens one of the alliance members, increasing the output of both member firms. Capturing the intuition, authors illustrate the situation with an alliance between one peanut butter firm and one jelly firm. Since an increase in the output of peanut butter increases the output of jelly, the peanut butter firm produces more after being allied with the jelly firm. This illustration implies that alliance formation may lead these two firms to internalize demand externalities.

In forming the description above into Lufthansa and United Airlines code-sharing agreement, the theory suggests that as United links more cities to Lufthansa's network it may increase volumes for Lufthansa. If the complementarity service demand increases, so does the service on the interhub

segment. Consequently, Lufthansa can set capacity according to aggregated demand containing both the operational demand for non-stop travel and connecting travel (considering no capacity constraint). The degree of complementarity can also be applied into cross elasticity of demand where, in the same supply chain, a price change of one firm impacts the partner firm's output.

4.5 Resolving a complementarity in airline partnership

There are some measures to be taken in order to maximize value created so that the upstream supplier can set price at marginal cost and use a fixed fee to capture the additional value created. This section demonstrates tools that airline may use in order to establish commitment.

4.5.1 Cross-Ownership

Cross-ownership are most often restricted to prevent cross-border mergers. Commonly, National carriers have stipulations which prohibits foreign ownership over 50% of the national carrier's shares. The foreign ownership of U.S. carriers are limited to 25% of total shares.

Nevertheless, cross-ownership can theoretically be applied to airline alliance structures. This refers to cross shareholding or equity alliance, in which one airline buys a share of stock in its partners. Cross-ownership is efficient, in theory, due to reduction in partner perception of opportunistic behavior, reducing transaction cost and uncertainty. Zhang & Zhang (2005) illustrate this in a formula where complementary alliance members maximize own profit and to some extent partners profit. The decision problem faced by firm 1 and 2 can be shown as follows:

$$\max \pi^1 + s \pi^2 \equiv \max \pi^{12}(Q; s)$$

$$\max \pi^2 + s \pi^1 \equiv \max \pi^{21}(Q; s)$$

The intuition by the above formulation is as follows: When making quantity decision, firm 1 or 2, respectively maximizes own profit and also to the extent s partner's profit, where $0 \leq s \leq 1$.

The parameter s may also be considered the degree of cooperation in alliance/partnership. When $s=0$ both firm 1 and 2 act independently. As parameter s increases, so does the level of cooperation, with the maximum level of $s=1$ where the situation is characterized by full integration, and the two firms can be said to act as a single decision making unit in their joint profit maximization.

In addition, commitment may be illustrated in an alternative situation commonly known as block seats, where a carriers purchase certain amount of seats on board the partner. Thus, the partner commits to purchase these seats whether or not it manages to fill the seats. In this perception a strategic alliance is thus different from an ordinary alliance in that the partner here makes a more serious commitment (ibid).

4.5.2 Block seats arrangement

In general code-sharing contracts, the operating carrier determines seat availability for the alliance partner. However, each airline can set price individually. Usually, all sales revenue for the code-share flight goes to the operating carrier and the ticket selling carrier only gets a “booking fee” (Zhang and Zhang 2005).

With a block seat pricing scheme the airline bundles the quantity willing to sell with the total fare wishing to charge for that quantity. This is a strategic cooperation regime where one of the partners buy a specific amount of seats on a given flight operated by the other partner. Block seats arrangement can be viewed as a strategic commitment where opportunistic behavior is reduced. Accordingly, block seat arrangements give incentives for the non-operating carrier to commit more efficiently (Zhang & Zhang, 2005).

4.6 Elasticity measures

Elasticity is one of the fundamental concepts in understanding the theory of demand and supply. By en large, elasticity measures relative changes i.e. percentage change in one variable divided by the percentage change in another variable. Different elasticity measures defines special “subcategories”. These have specific impact on demand and supply. The “subcategories” can mainly be divided in: *Price elasticity of demand, income elasticity of demand, and cross price elasticity of demand.*

4.6.1 Price elasticity of demand

When airlines are able to identify passenger “type” or “group”, it enables price-setting according to elasticity of demand. Basically, this indicate high fares being set where elasticity of demand is low and low price in markets where elasticity of demand is high. This implies that when airline produces homogeneous products, different groups of consumers end up paying different prices for the same product. As a result, passengers buying non-stop products and passengers purchasing connecting products may, at the margin, be substitute passengers for the same seat on an aircraft.

Different elasticity values leads to different effects on the level of total revenue a firm receives. For example, if a good is elastic and a firm increases the price, by say 8%, it will lose more than 8% of their business. Thus, although they are getting more money for each one they sell, they are selling far fewer.

A simple formulation can be applied in the form of:

$$E_d = \frac{\Delta Q_d / Q_d}{\Delta P_d / P_d} \quad \text{or} \quad E_d = \frac{P}{Q} \frac{\Delta Q}{\Delta P}$$

Where E_d = Elasticity of demand, ΔQ_d = change in quantity, ΔP_d = change in price.

4.6.2 Cross-price elasticity of demand

The consumption of a good is not only dependent on that goods price. It may also be affected by changes in prices of another good/service. This can be shown by the cross price elasticity of demand, which show how substitutes or complements are affected by price change in one of the products that correlate the other product in the same supply chain. The cross price elasticity of demand may be used measuring substitutability in consumption. It can be defined as the percentage change in demand for good A that occurs when there is a one percent change in the price of another good B.

The airline industry encounters different kind of services which can be identified as substitutes e.g. competing airlines, other transportation means of travel such as cars or trains.

The interesting measure, regarding this paper, is that which measures the responsiveness of the quantity demand of a good to a change in the price of another good. If the demand of good/service A decrease when there is a price increase of good/service B, we say that these goods/services are complements. The two goods/services that complement each other show a negative cross elasticity of demand. We can formulate this according to:

$$E_{A,B} = \frac{\Delta D_A}{\Delta P_B} < 0$$

The intuition can be formed in the Finnair and American Airlines case by considering that a price increase for code-share flights operated by AA effects quantity demanded from AY's HEL-JFK leg

of the trip. This occurs as the non-stop HEL-JFK segment is used for taking code-sharing flights from JFK outwards.

4.7 Price discrimination

Price-discrimination, also closely referred to revenue management or yield management, enable airlines to adjust passenger volumes and prices. In general it is a measure that firms may take in order to improve profits. The purpose of price discrimination is to capture the markets consumer surplus. The tactics in price discrimination enable extracting different prices for the same product or service according to customer willingness to pay. Therefore, price discrimination techniques makes it possible to charge different prices to different customers for the same product. It gives the firm a possibility serving both the ones willing to pay less, with smaller profit, and those willing to pay more, with larger profits (Pepall et al., 2005) .

A monopolist does not find it profitable to lower prices to all its customers in order to gain additional consumers. This occurs because then the price reduction limits the monopolist's incentive to serve more consumers. Theory suggests that a monopolist under-supply its product relatively to the efficient outcome. There are different techniques for a firm to earn higher profit in a monopolized market. When a monopolist determine the right output level, in order to maximize profit, it identifies demand at each price.

Airlines use different revenue management systems where information on consumer demand are stored and by which airlines strive to extract the best possible price for a given amount of units. If a firm exercising monopoly power over a given market can rise its price above marginal cost without losing all its clients, it leads to welfare loss for the society (unless the firm is able to price discriminate perfectly). Thus, the monopolist must know how consumers differ in their demand for its product (Tirole 1988).

Price discrimination can generally be classified into three different categories

(Pepall et al., p.86-105) :

- First-degree, where price varies by customer and the consumer pays the maximum he or she is willing to pay
- Second degree, where price varies according to quantity sold. Larger quantities are available

at lower unit price

- Third-degree price discrimination, or group pricing, will be considered more closely in the scope of this paper.

4.7.1 Third degree price discrimination

Third-degree price discrimination is often referred as group pricing where the monopolist divides consumers in different segments according to willingness to pay. These groups may be, for example, age, income, geographic location, or educational status. Airlines may also use different qualities of service whilst attempting to capture consumer surplus.

Airlines are proficient in third degree price discriminating passengers. The different fares on a particular flight can be applied according to seat availability, time in advance by which the flight must be booked, flexibility of the ticket, how long the ticket is valid for travel, changeability of the ticket, geographical location etc. all dependent on restrictions and characteristics of the ticket type. An essential feature of third-degree price discrimination appears as schemes where firms may easily observe the different characteristics of its consumers, and thereby use it as a proxy for differentiating consumer's willingness to pay. It is also important for the monopolist to be able to divide its consumer groups markets so that it is possible to credibly charge a different price. In the airline example we can consider the requirement to stay over Saturday night, that is very typical in discounted fares in comparison to those traveling on business and who are not. This is also an example of the variation of the basic product i.e. traveling in economy, business, or first class. However, in this context it is worthwhile mentioning that price discrimination exists only if the net cost are not justified by the difference in underlying costs between the different versions of the product/service. When the different target segments have been separated according to different characteristics, one is able to declare the common rule for third-degree price discrimination, as stated in Pepall et al. (2005): "consumers for whom the elasticity of demand is low should be charged a higher price than consumers for whom the elasticity of demand is relatively high".

Even though different micro factors affect price- and volume levels, a lower price encourages more people flying, however, leaves airlines with little surplus from its passengers.

Instead of treating each single segments as a separate unit, where price are set in both markets, we can form a market where output levels and price levels are integrated as one single separated market

(Pepall et al. 2005, p.92). Pepall et al. (2005) gives a good example on how, in theory, cutting back or increasing total production in a specified market would therefore raise profits. Basically the firm may shift sales from a low marginal revenue market to high one, and thereby raise revenue and extract more profit with no increase in production.

This may be applied well in airline industry. As the quantity (capacity) is set, the marginal cost of taking an additional passenger aboard is low. Further, this is a good example of how one element of third-degree price discrimination works. By feeding traffic from short-haul sectors into long-haul via hub airports, airlines attract additional passengers. A practical example of this can be illustrated as follows. Consider a person living in Helsinki and another in Tampere. These both would like to fly to New York with Finnair. This indicates that the one living in Helsinki may take a non-stop flight from Helsinki to New York, however, the one living in Tampere flies first to Helsinki and switches to a plane departing to New York. Should Finnair charge the one origin at Tampere two separate fares, one from Tampere-to-Helsinki and an other from Helsinki-to-New York, or should the fare be basically the same for both passengers? Indeed, this consideration is the base for yield management. The airline decides what amount of the total output to sell in each market in order to maximize profits.

In general it is considered that a person traveling between origin and destination prefer fewer stops. The Tampere inhabitant encounters an inconvenience for having to take a connecting flight to her destination (*ceteris paribus*). Nevertheless, the airline can and will price discriminate between these two passengers. In general this occurs as the operational cost of feeding traffic from short-haul sector to long-haul sectors is profitable for the airline. By this behavior airlines take advantage of economies of traffic density. From the airline point of view, the marginal benefit exceeds the marginal cost of serving that additional customer from Tampere to New York. Taking other factor constant, elasticity of demand differs for the one living in Tampere compared the Helsinki inhabitant. Moreover, the airline price discriminate between non-stop and connecting passengers so as to attract more demand. Thus, taking all other things constant, the price elasticity of demand differs according to number of stops on an itinerary.

4.7.2 Price discrimination and code-sharing

As illustrated above carriers may identify between passengers with one segment and those with more than one segment. This occurs as service is provided with the same airline. The same feature takes place when alliances form code-sharing contracts. Indeed, the alliance are able to price-

discriminate between non-stop and connecting passengers. This means that the sub fares charge to interline passengers are different from the fares other passengers have to pay for the same trip. This is an example of third degree price discrimination (Czerny, 2006).

Nevertheless, as stated previously current studies indicate that code-share contracts under complimentary route structure alliance generate positive effects. This indicates that interline passengers benefits from code-sharing and antitrust immunity, while the non-stop passengers can be worse off. To put it in context of an example, one might even say that the non-stop passenger flying between a given city-pair pays for the connecting passenger sitting beside him.

In fact, without code-sharing, if airlines could not price-discriminate between connecting passengers and non-stop passengers the outcome could be quite different. Indeed, since the interline passenger encounters inconvenience not being able flying non-stop, she may be assumed having a higher price elasticity of demand than a non-stop passenger. If an airline is **not** able to distinguish between connecting and non-stop passengers, and the price elasticity for the connecting passenger is higher than for the non-stop passenger, it may lead to situations where airlines decide on reducing fares in the non-stop markets. This in order to attract additional demand from connecting passenger. The outcome implies that the non-stop passenger clearly benefits from the existence of connecting passengers. This would be the case where price discrimination would not be applied (Czerny 2006).

With regard to the above, the situation gives the fundamentals, and an interesting prospect in investigating whether the Finnair's monopoly route between HEL-JFK has been affected by higher or lower passenger levels (and fare levels), pre- and post-alliance situation. It also makes an interesting reference to investigate whether output have changed in oligopolistic markets e.g. LHR-JFK, where there exists more than two carriers serving the same segment, and non of the operating airlines have antitrust immunity or wide code-sharing contracts.

Czerny (2006) investigated how airlines with complementary networks effect interline contra non-interline passengers in the case of code-share, antitrust immunity and no immunity. The investigation shows that when an airline do not have code-sharing contracts it loses the ability to price-discriminate between interline and non-interline passengers. Consequently, the airline sets only one fare for all passengers in each city-pair connection. Further, this implies that the fare on a specific route depends on the aggregated demand from both connecting and non-stop passengers. The outcome of Czerny's (2006) investigation shows that the negative welfare effect of price

discrimination on the non-stop passenger can outweigh the positive effect on the interline passenger. The results holds for both code-share and code-share with antitrust immunity.

5 Theoretical background on code-sharing and antitrust immunity- the effect on markets

This part of the thesis analyses common theory coined to code-sharing and antitrust immunity literature. Focusing on vertical integration the section analyses how to resolve complementarity in airline partnership. This is done by presenting theory behind double marginalisation, and code-sharing as a tool of preventing this negative externality.

5.1 Vertical integration

The incentive for firms to vertically integrate in a simple setting can be dated back to Cournot (1838). Cournot described a situation where two monopoly price-setting firms (Zink and Copper) producing complementary products in their own product line had the incentive to vertically integrate, and thus extract higher profits. Cournot showed that in dual quantity setting model, the single integrated monopolist has lower price than the sum of the two independent price-setting firms. The results in the game was based on non cooperative structures where each of the vertically related firms ignore the fact that the other firm is also collecting a mark-up.

Cournot's model considers that these two monopoly firms would merge and that there are a lack of substitutable products in the market. Thus, the situation does not provide a perfect base for applying aviation industry in complementary networks. Nevertheless, I find it an interesting setting which can indirectly be applied to alliances. The theory assumption can illustrate the frame for incentives when carriers choose to seek for alliance cooperation and take advantage of economies of scale and scope. The intuition can be formed the following way. Consider that each firm's (airline's) pricing decision imposes an externality on the other firm. If firm 1 takes a high price for its service it reduces the demand for firm 2 service, when operating in the same complementary supply chain. Firm 1 does not take into account the impact its pricing decision has on firm 2's demand. As a result, in the non-cooperative equilibrium, the price of both goods are too high. If firm 1 would cut its price on the service it provides, it would generate additional demand for firm 2's service, and thereby it would also increase profits for firm 2. However, since firm 1 does not receive any additional profit, it does not reduce its price. This implies that with cooperation, both firms may lower prices and be better off. In addition, consumers would gain from the surplus as a result from lower prices and expanded output.

The core of the above stems from efficiency gains of cooperation when two firms merge. The merger of two firms creates a single decision making entity, which internalizes the negative externality of individualized pricing decisions. This leads the two firms to maximize total profit, which imply that it wishes to price the two individual services as to maximize the joint profit of each (Pepall et al. 2005, p.425-445). Precisely the same issues of cooperation are present when two firms in a complementary relationship are occupying different levels in the vertical production chain. Though the following are not considered in the the scope of this paper, it is worth mentioning that this type of vertical mergers has also raised concerns about foreclosure effects on competition. That is, the upstream partner would refuse (after the merger) to serve the downstream rivals, and thereby drive them out of the market or create barriers of entry that would facilitate collusion. This conduct has ambiguously been recognized in alliance formation by previous literature. When airlines form alliances some of the increased traffic is attained from rival airlines. This indicates that as alliance increase traffic, rivals decrease it (Zhang & Zhang, 2005).

5.2 Double marginalisation

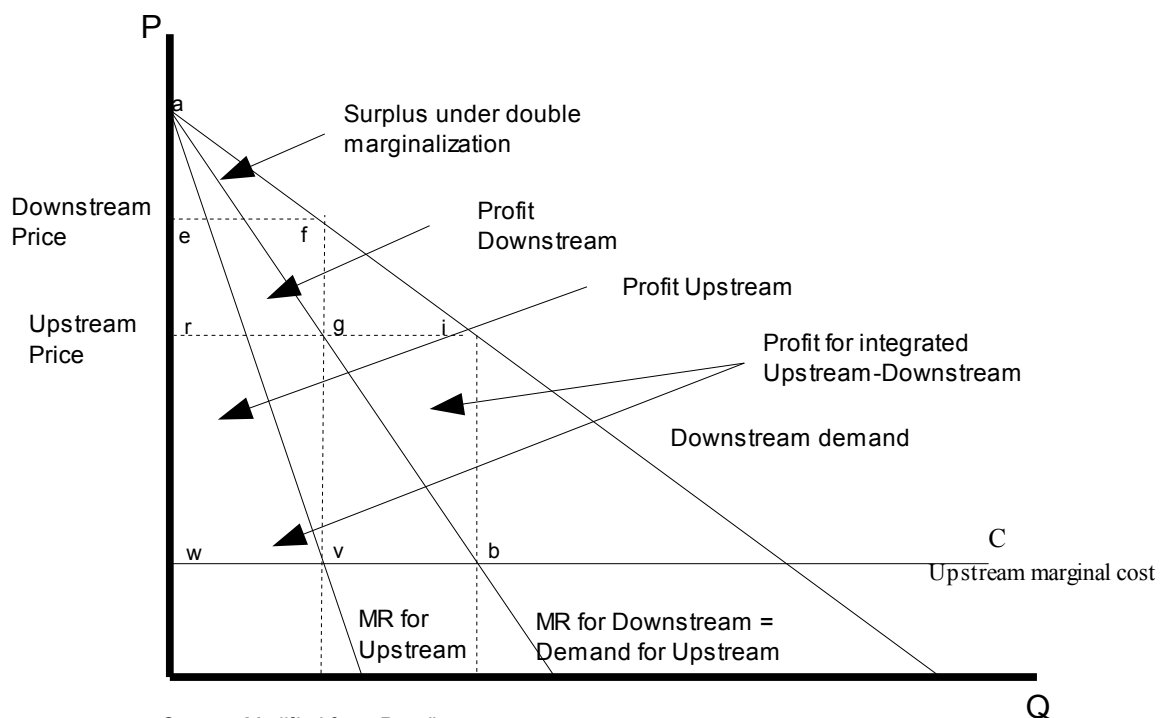
The double marginalisation which crates a “vertical externality” arises when there is more than one firm in the vertical supply chain facing a downward sloping demand curve and has the incentive to mark-up over the marginal cost of the product’s price. A sequence of mark-ups leads to higher retail prices and lowered combined profits for both firms in the supply chain. This most often have negative welfare implications. However, vertically integrated firms, potentially, avoid double marginalisation. The literature suggests some potential solutions to eliminate double marginalisation through acquisitions or franchising.

Pepall et al. (2005, p.426-430), gives a formal illustration of the problem with *double marginalisation*. The authors have a setting that is composed by an upstream supplier (the manufacturer) selling products to a single downstream firm (the retailer). The outcome of the illustration shows that if retailers and manufacturers merged, the situation would result in consumers being charged a lower total price. Accordingly, merged firms sell more of the products than did the two independent firms. The results show that profits earned by the integrated firm is greater than the aggregate pre-merger profit by the manufacturers and the retailers. Therefore, the firm produces more and the product price is lower, leading everyone to benefit from the integration of the two monopolistic firms. As a result, the merger outcome provides greater social welfare.

The impact of double marginalisation is illustrated in figure 4, where the downstream supplier’s

(retailer's) marginal revenue curve, MR, is the upstream supplier's demand curve. Double marginalisation results when the upstream supplier sets the wholesale price at r above its marginal cost C , and then the downstream firm adds on a further mark-up above this wholesale price by setting the profit-maximization retail price e . The downstream firm earns the profit generated from the area $refg$. Thus, upstream supplier or wholesaler earns the profit shown as the area $wrgv$. An integrated upstream-downstream supplier, with the marginal revenue curve that is just the same as the marginal revenue curve of the non-integrated downstream firm, sets price to consumer at r . The area $refg$, which is the profit that the downstream supplier would have earned as a single decision making firm, is now transferred to consumers as consumer surplus. However, increasing sales volume accrues the integrated firm's profit equal to $gibv$. From the firms view point, the loss of area $refg$ is more than compensated by the area $gibv$. The ultimate integration outcome shows that both firms (now a single decision making unit) are better off with output increase and higher profits than the aggregated pre-merger profits of the two separate units. This indicates that consumers are being charged lower prices r resulting in greater consumer surplus, which is shown by the area rai instead of double marginalisation surplus eaf .

Figure 4: The double marginalisation problem



Source: Modified from Pepall, Richards and Norman (2005).

5.2.1 Double- marginalisation in the alliance structure

The above described situation is applicable in the partner airlines case, and also as a whole into the aviation industry where two carriers and passengers benefit by integrating complementary networks. The pure operating carrier, lets say American Airlines, is comparable with the upstream supplier that provides the essential input to the downstream plating carrier, Finnair (the one issuing the ticket and selling seats on board partner's plane). Accordingly, Finnair combines the service with other, complementary, inputs in order to be able to provide the final product to passengers/consumers.

When the airline without alliance makes pricing decisions for interline fares, it chooses the fare through a process of strategic interaction. In this model (without alliance structure) each of the two airlines chooses its "subfare" for own segment, taking the other airlines segment fare as given in Cournot fashion. When these two airlines do not cooperate, each of the airlines ignore the negative impact on the other carrier's profit when raising the own "subfare". However, when these two airlines operate under antitrust immunity they set overall fares in cooperative fashion focusing on joint profit. The effect that remains is that the negative externality of these two sub fares are internalized, eliminating double marginalisation. This is the situation where both take into account the impact on one another's profits. Moreover, the situation leads to lower fares and higher traffic in the relevant city- pair market. Thus, as suggested in previous literature, an alliance may result in higher fares in gateway markets, however, generating lower fares for connecting passengers where both carriers are used. Nevertheless, by integrating activities, consumer welfare is likely to increase on net (Bruckner, 2001).

6 The trans-Atlantic models and empirical research assignment

This section develop network structure models which constitute the foundation to the empirical application. I setup and explain three different route models, including a description on the practical characteristics.

6.1 Detailing and visual illustration

In figure 5, 6, and 7 the network structures are setup to illustrate the trans-Atlantic model between hubs-and-spokes for investigated alliances. From figure 5, let **F** indicating Frankfurt and **C** Chicago and **D** and **A** gateway spokes, respectively. Both LH and UA operate the gateway route. Thus, this is an example of a parallel route. For illustration we can consider that spoke **D** is Dusseldorf and

spoke **A** is Albuquerque. If the passenger would like to fly from either **A** to **D** or vice versa (pre-alliance), the traveler would have to purchase two separate tickets (possibly one with UA and the other with LH). Thus, LH can in the basic form, serve only trans-Atlantic passengers on segments **DC** and **FC**. However, post-alliance period, after code-sharing and antitrust immunity was granted, allowed for formal changes. As a result of the alliance, LH/UA may sell tickets under their own name to destinations that they don't actually serve. Code-sharing is depicted as LH/UA, and indicate that even though LH has sold the ticket, UA is the one carrier operating the flight. In this setting code-sharing is provided by alliance airlines both in the international gateway market and the domestic hub-to-spoke market.

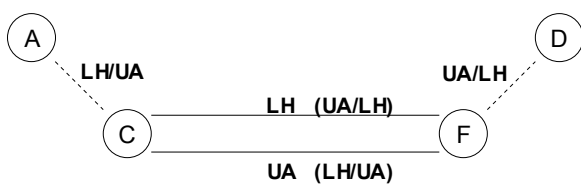


Figure 5: Duopolistic model with Lufthansa (LH) and United Airlines (UA)

From figure 5, Lufthansa, by code-sharing, is able to serve trans-Atlantic passengers between **DC**, **DA**, **2FA**, and **2FC** (i.e. one flight operated as “pure” LH and the other indicate a code-share flight with United Airlines, LH/UA). This gives a larger supply network for the

airline. The outcome may lead in increasing passenger levels. Further, as a result of the alliance carriers may now sell seats on partner airlines. Consequently, this allows increase in frequencies without actually increasing capacity (e.g. an increase from **FC** to **2FC** in the non-stop segment).

The network in figure 6 is set up so as to illustrate that Hub **H** is Helsinki (HEL) and **K** New York (JFK). **N** represents spokes to Hub **H**. The amount of spokes connected to Hub **K** are indicated with variable **Z** and varies according to Finnair’s network development during the defined time span.

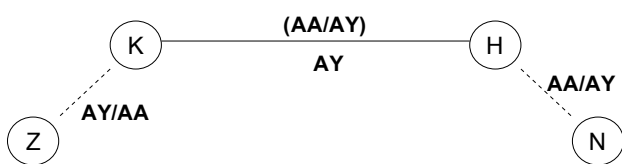


Figure 6: Monopoly model with Finnair (AY) and American Airlines (AA)

American Airlines (AA) serves flights between hub **K** and its spokes, **Z**. Hub **K** spokes corresponds to code-share routes between AY and AA, and is therefore dependent according to agreements and code-share settlements. The

indication for code-sharing is illustrated as AY/AA. This is as example of a monopoly route structure from Finnair’s point of view. Thus, this enables AY deciding price and quantity between connecting and non-stop passengers so as to maximize profits. Furthermore, monopoly provide AY more independent decision making compared to duopoly or oligopoly structures. Therefore, AY does not have to consider AA’s decision between prices and quantities between **H-K**, and may adjust capacity and prices accordingly.

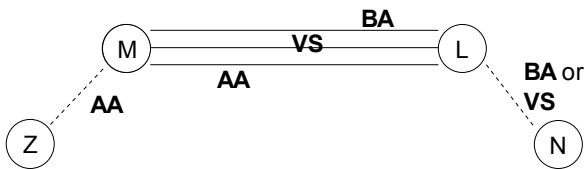


Figure 7: Oligopoly model with British Airways (BA), American Airlines (AA), and Virgin Atlantic (VS)

Figure 7, is depicted so as to illustrate a trans-Atlantic route network characterizing that of an oligopoly market between few large competitors. As an example, I consider British Airways (BA), American Airlines (AA), and Virgin Atlantic (VS)

as the main rivals. As illustrated, there is no code-sharing between these airlines. Thus, AA is the only carrier taking passengers between **M** and **Z** (online). Furthermore, BA and VS may take passengers between **L** and **N** (online), respectively. In this model each airline faces higher level of competition than that of duopoly or monopoly. Moreover, the traffic levels are also far higher in comparison to duopoly or monopoly. For example, London and Miami is a good example of a non-stop route where these three airlines are the main rivals. However, most of the routes between London and US cities are operated by more than these three airlines.

When conducting the empirical estimation, the focus is on total traffic levels between the hub airports of the respective airlines. Naturally, the pre-alliance period does not consider code-sharing or antitrust immunity implications. However, the planned theory outcome analysis is based on the following itineraries in the pre- and post-alliance case (there are no alliances among carriers in figure 7)¹⁹:

- Passenger volumes from LH spokes to UA hub
 - Passenger volumes from LH spokes to UA spokes
 - Passenger volumes from LH hub to UA spokes
 - Passenger volumes from LH hub to UA hub
- } Aggregated traffic levels according to figure 5

The passenger traffic between F and C is considered from LH's perspective. The basic itinerary structure is identical for UA. There is also the code-share possibility which enables the partner carriers selling seats on each others' hub-to-hub flights. This indicates that both of the carriers may offer more frequencies to its customers without increasing its own, individual, aircraft capacity.

- Passenger volumes from AY spokes to AA hub
 - Passenger volumes from AY spokes to AA spokes
 - Passenger volumes from AY hub to AA spokes
 - Passenger volumes from AY hub to AA hub
- } Aggregated levels, figure 6

The passenger traffic is considered from AY's perspective as AA does not operate between H and K.

¹⁹ It is worth noting that between the period of 1993-1996, BA had an complementary alliance with USAir. This will also be considered when forming the empirical results on passenger output between the respected city pairs.

- BA passenger volumes from BA hub to AA hub
 - AA passenger volumes from BA hub to AA spokes
 - VS passenger volumes from VS hub to AA hub
- } Aggregated levels, figure 7

In the empirical part, the total passenger traffic between L (London, LHR)) and M (all US gateway markets in the sample) is calculated for five different airlines, as shown in table 1.

6.2 The welfare analysis considering applicable data

Quantifying the size of welfare impact following code-sharing and antitrust immunity is not that straightforward. Most studies of welfare implication focuses on analyzing welfare effects of price changes. There are, however, many situations in which policy options are directly related to quantity changes. The welfare effect of quantity changes are associated with the inverse demand function where commodity prices are dependent on their quantities. Welfare analysis of quantity changes implies that prices are taken as endogenous, and quantities are exogenous. In order to establish proper welfare effects measurements it requires either price- or quantity variable to be used as exogenous. This choice of welfare measure is empirical in nature. For individual consumers it may be reasonable to assume that the supply of a commodity is perfectly elastic, and thus prices may be taken as exogenous. However, this assumption may not be tenable for consumers in the aggregate or when highly aggregated economy-wide data are utilized to estimate demand relations. At the aggregate level quantities are more properly viewed as exogenous than prices. Although individual consumer behavior is determine by given prices, the quantities of commodities are predetermined by production at the market level, and prices must adjust so as to consume the available quantities. This implies than prices may be considered as a valid estimate in analyzing welfare at the individual level, however, quantity-based measures may be more preferable at the aggregated level. Moreover, quantity-base measures are essential for analyzing the welfare effects for non-competitive firms or industry behavior. For example, a monopoly producer is a price-maker, and the relevant demand is an inverse rather than direct demand function. Thus, welfare is analysed in terms of the quantity of output (Kim 1997). In addition, Bailey and Liu (1995) find that welfare gain increases as the airline industry is heading towards more consolidated market structures. This is established through the fact that consumers care not only about price but also about service convenience measured by networks size. The model predicts that by integrating airline networks, welfare increases and the effect may be calculated using output as proxy. Moreover, findings show that quantity measures have outweighed the price increase effect of having a smaller number of competing national airlines (ibid.).

For airline alliances in particular, it appears that performance has been measured mostly by using

market shares and sales volume as proxies for performance. As there are no available ticket price data, this thesis analyses market outcomes based on changes in quantities. Nevertheless, following the above formulation it can be found solid to say that after controlling for external effects, welfare may be indexed by observation shifts in quantity. Therefore, it may be rather robust to suggest that an expansion in output/quantities may be considered welfare enhancing. However, this statement is restricted to the acquired data, and therefore limits to form any comprehensive generalization.

In order to be able to control for carrier-, route-, and year-specific effects, I include dummy variables to represent “individual” effects. Moreover, in contrast to previous research, this paper partially controls for error structures by looking at aggregated market levels. Thus, I divide each carrier’s yearly route specific traffic with yearly aggregated sample traffic. This proxy is then indicated as passenger traffic measured by route specific “market shares” corrected for aggregated passenger levels. Thereby, the intention in the thesis is to replicate previous research by using total output as dependent variable, however, subsequently correct for route- year- and carrier-specific effect in aggregated “market share” levels²⁰.

7 Data and Methodology

This section introduces data and the methodological formulation to the empirical part of the research assignment. The aim is to present different measures taken in order to assess the effect of code-sharing and antitrust immunity. First, data sources are indicated. This influenced the methodological approach. Secondly, a descriptive analysis is performed in order to shed light on expected outcomes. Lastly, a structural estimation based on data collection is performed so as to estimate code-sharing and antitrust immunity outcomes.

7.1 Data collection

For each of the alliance routes, I collected partner’s traffic, non-partners traffic, and total traffic data from ICAO (International Civil Aviation Organization) publication, *Traffic by Flight Stage* (TFS) database. The number of carriers on specific routes were also obtained from ICAO database. The alliance routes were identified by mainly using the information provided by the ICAO. To verify alliance continuance, and in order to identify whether the alliance route were one where the partners were able to collude legally, I contacted a consultant from ICAO based in the UK²¹. The

20 Specifically, this indicates that each year, carrier, and route have been divided with the sample’s aggregated yearly traffic. Hence, the dependent variable in the regression is named “market shares adjusted for aggregated levels”. The benefit of this approach is presented in coherence with the results in section 9.2.

21 If needed, I can provide more specific information and contact details for the person in question.

trans-Atlantic data is collected for four different European hubs that connect to five different U.S. hubs. Since the data consists of different airlines and alliances through time, I have panel records for trans-Atlantic routes for the 1989-2007 period. During the sample period, three alliances are considered: British Airways-USAir (only 1993-1996), Northwest-KLM, Lufthansa-United Airlines. Table 1 show the 15 different sample routes²².

Route	Alliance partners	Operating carriers in the sample	Alliance type
Helsinki-New York	Finnair/American	AY	C
Frankfurt-New York	Lufthansa/United	LH	C
London-New York	BA/USAir	BA,AA,VS,UA,CO	C
Amsterdam-New York	KLM/Northwest	KL, NW	C
Frankfurt-Chicago	Lufthansa/United	LH,UA,AA	C+P
London-Chicago	BA/USAir	BA,AA, UA	C
Amsterdam-Chicago	KLM/Northwest	KL,UA	C
Frankfurt-Washington	Lufthansa/United	LH,UA	C+P
London-Washington	BA/USAir	BA,UA,VS	C
Amsterdam-Washington	KLM/Northwest	KL,NW,UA	C
Frankfurt-Atlanta	Lufthansa/United	LH,DL	C
London-Atlanta	BA/USAir	BA,DL	C
Amsterdam-Atlanta	KLM/Northwest	KL,DL	C
Frankfurt-Miami	Lufthansa/United	LH	C
London-Miami	BA/USAir	BA,AA,VS	C

Table 1: Alliance routes in the sample. AY=Finnair, AA=American Airlines, LH=Lufthansa, BA=British Airways, VS=Virgin Atlantic, UA=United Airlines, DL=Delta Air Lines, CO=Continental, KL=KLM, NW=Northwest Airlines. C stands for a complementary alliance, and P indicate a parallel alliance.

7.2 Descriptive analysis, statistical structure, and expected outcomes

The alliance type for each of the routes was determined according to the networks structure. If the alliance route was organized so as to feed traffic to the partner carrier (to each other) beyond an alliance route, the alliance is regarded as a complementary alliance. If the two carriers before entering an alliance were competing on that route, that alliance is regarded as a parallel alliance. The indication for parallel and complementary alliance is illustrated in table 1 as P and C, respectively. There are no single parallel alliances. However, the sample includes two routes which have characteristics of both parallel and complementary structures. This indicates that during the pre-alliance stage the two carriers were competitors, and throughout the post-alliance stage the alliance cooperated not only on those routes but also beyond those routes. I treat those alliances as both complementary and parallel in nature. Subsequently, I distinguish between pre-alliance and post alliance periods, for each of the alliance routes. During the regarded timespan, complementary

²² Finnair is not included in the regression.

alliances took place on all 15 routes²³. After the year 1997 all the traffic connected from London were treated as non-alliance routes.

In order to make a thorough investigation I would need each carrier's local local traffic in a city par. Unfortunately, reliable data is not available at the international level. Therefore, I was forced to make an approximation. Specifically, I gathered segment passenger volumes between cities from ICAO, TFS database. Thus, the data lists scheduled passenger quantities for each airline in each year. Therefore, the segment passenger volume may include both connecting and local passengers on a route. The market is then defined as city-pairs where the passenger can take either a non-stop flight, or a connecting flight which include at least one stop between origin and destination. Accordingly, following code-sharing, partners may use code-sharing to sell tickets on each others segments between hub-airports and local markets. Further, this shows that the alliance may serve passengers on i) non-stop segment between gateway cities, and ii) connecting itineraries, utilizing both code-sharing and the non-stop services.

7.3 Constructive estimation

Considering the above setup for the code-share network, where partners feed traffic to each other, the demand for seats in service between gateway cities are expected to increase. Thus, partners likely have incentive to take advantage of economies of scope, where integration increase destination choices. Both non-stop and connecting passengers must travel on the gateway segment. As a result, passenger volumes are expected to increase in the gateway market. This is also where yield management techniques play a distinctive role allocating seats based on passenger "characteristics" or origin and destination, as to maximize partners' revenues. As the pool of passengers to whom the seat can be sold increases, airlines may take advantage of economies of traffic densities and lower costs (depending on the lack of capacity). However, as passenger volumes increase in the gateway market, airlines could also use yield management practices to extract higher yield per passenger and "artificially" lower volume levels in specific routes.

Table 2, compare aggregated overall traffic changes between an alliance and rivals, respectively, on routes described in table 1. The columns in table 2 show the following properties:

P1= The pre- alliance period (year)

P2= The code-sharing period (year)

23 BA terminated their code-share agreement with USair in 1996

P3= Antitrust immunity period (for Lufthansa/United Airlines and KLM/North West Airlines, respectively)

ΔQ_{p2} = Calculated average traffic changes during P2

ΔQ_{p3} = Calculated average traffic changes during P3

Q_{p1} = Represents the average of yearly total passengers carried over P1

Q_{p2} = Represents the average of yearly total passengers carried over P2

$\frac{\Delta Q_{p2}}{Q_{p1}}$ = indicates the % of traffic change from P2 compared to the average yearly traffic of P1

$\frac{\Delta Q_{p3}}{Q_{p2}}$ = indicates the % of traffic change from P3 compared to the average yearly traffic of P2

From Table 2, passenger traffic in period 2 has increase from period 1 for all airlines. In period 2, the three alliances together, increased passenger volumes by some 52.560 passengers annually on routes served by the alliance carriers. LH and UA increased traffic in the code-sharing period by an average of 24,9% on its alliance routes, as compared to 14,7% for the rival carriers. During the antitrust immunity period LH/UA passenger traffic soared on alliance routes by an average of 73,2%, when rivals decreased output by an average of 18,1%. Combined, KL and NW experienced only a modest average increase of 19,2% compared to rivals passengers' increase of 55,6%. Comparing Antitrust immunity period to code-sharing period, table 2 indicate that KL/NW has been able to increase average passenger volumes by 42%. During the same period their rival carriers have been able to more than double their average passenger volumes. This inconsistency with previous research may, however, depend on the sample routes. The sample routes does not show strategically important hub airports for NW. If this research had used traffic levels on, for example, Detroit-Amsterdam or Minneapolis-Amsterdam, the passenger traffic levels may have been far higher than those of the sample routes. This stems from the reason that KL and NW hub at both Detroit-Amsterdam and Minneapolis-Amsterdam, and NW funnels a high traffic density via Detroit and Minneapolis.

When BA and USAir code-shared, BA increase trans-Atlantic traffic by an average of 24,1%, as

compared with an average increase of 32,5% in the rival carriers case. After terminating their code-sharing agreement passenger levels soared in period 3. This 3 period increase of 18,6% is relatively modest comparing to rival carriers increase of 35,1%. However, this may also indicate that BA have decreased market shares in specific markets as they applied for immunity together with AA. If BA decreased departures it reflects diminishing passenger levels.

Route	Alliance partners	P1	P2	P3					$\frac{\Delta Q_{p2}}{Q_{p1}}$	$\frac{\Delta Q_{p3}}{Q_{p2}}$
			Code-Share	Antitrust immunity	ΔQ_{p2}	ΔQ_{p3}	Q_{p1}	Q_{p2}		
Frankfurt-U.S. (Rivals)	LH/UA	1989- 1993	1994- 1996	1997-200 7	123.717 22.416	524.443 -36.768	495.087 152.331	716.503 202.798	0,249 0,147	0,732 -0,181
Amsterdam-U.S. (Rivals)	KL/NW	1989- 1991	1992- 1993	1994-200 7	60.470 27.913	143.052 109.172	315.312 50.170	341.310 83.409	0,192 0,556	0,419 1,308
London-U.S. (Rivals)	BA/USAir	1989- 1993	1994- 1996	(1997-20 07)	212.596 233.681	205.658 395.601	881.668 718.828	1.108.166 1.128.398	0,241 0,325	0,186 0,351

Table 2: Alliance traffic compared to rival airline traffic changes between gateway cities during 1989-2007

The comparison between partners' traffic changes shown in Table 2 appears somewhat consistent with expected effects of code-sharing. However, some concerns may be raised as well. The results for antitrust immunity period in the LH/UA case indicate that granting antitrust immunity may have decreased rival carriers' passenger volumes in the routes where LH/UA cooperate. Thus, granting antitrust immunity may not have been *Pareto optimal* in the LH/UA case. This imply that antitrust immunity may have indeed raised LH/UA alliance traffic levels, however, at the same time caused decreasing traffic levels for rival carriers. Thus, intrinsically imposing an "external disbenefit" or a physical pollution for those airlines competing with LH/UA. Nevertheless, no results of consumer detriment can be found.

In the Lufthansa and United example research shows that after launching the alliance, the trunk route between Chicago and Frankfurt, traffic connecting at either or both ends tripled as a result of the connections available at either end. Daily online passenger transfers had increase from little above 200 in 1993 to 600 in 1998, where as daily point-to-point had increase rather slowly. This is a good example of how airlines, with the help of code-sharing, are able expanding into new markets

and developing existing ones. The swift growth of transfer traffic made it possible for the LH/UA alliance to increase daily code-share frequencies from two in 1996 to four in 1998 (Doganis 2002, p.73).

Passenger level development for the sample routes in Lufthansa and United Airlines case are illustrated in Figure 8. The figure shows how Lufthansa and United Airlines combined yearly traffic levels and departures have developed on the trans-Atlantic market. Both traffic levels and departures have soared through out the last decade of the 20th century. The traffic levels are calculated as aggregated traffic between FRA-US on the sample routes for LH/UA versus their rivals as described in Table 2. The sample consists of few routes where Lufthansa faces competition, and this consideration may offset the balance of the actual real world situation.

Figure 9 compare traffic levels in a complementary and a parallel route structure. As shown, no indication supporting that code-sharing in the parallel route i.e. FRA-CHI decreases passenger levels. Furthermore, figure 10 and 11 show combined market shares for LH/UA on the route FRA-CHI (parallel alliance where both airlines hub at origin and destination) and FRA-JFK (complementary alliance where LH operate but not UA) by month over the period 1990-2003 and the timing of the alliance intervention. Examining the alliance shares of the FRA-CHI market, code-sharing period is characterized by a constant or a modest increase, mirroring the previously found results on traffic levels, and then an exponentially increase resulting from the antitrust immunity period. In the FRA-JFK segment, the alliance share appears to have remained rather constant or even negative in the code-sharing period, and stimulated much more as a result of antitrust immunity. Thus, a positive effect from alliance formation on markets shares may well be supportable in the immunity case. By contrast, there is no support for the notation that parallel alliances caused decreasing traffic output for the LH/UA alliance.

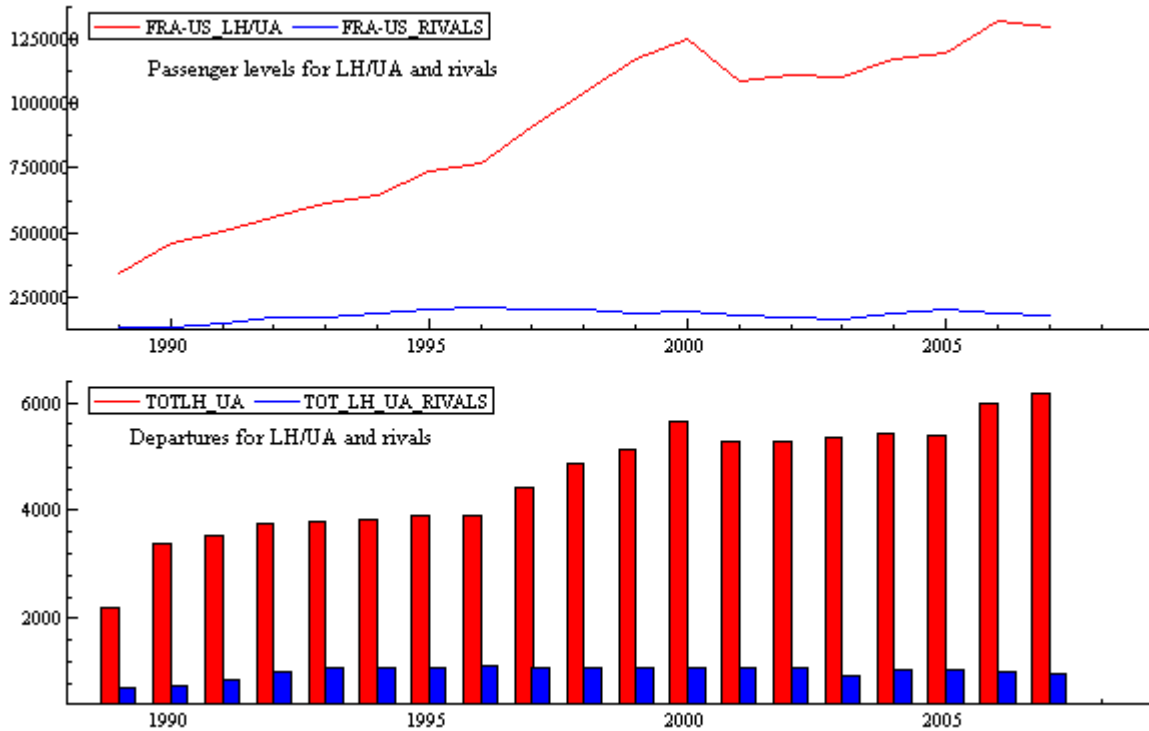


Figure 8: Combined passenger output and departures for Lufthansa and United Airlines compared to rivals

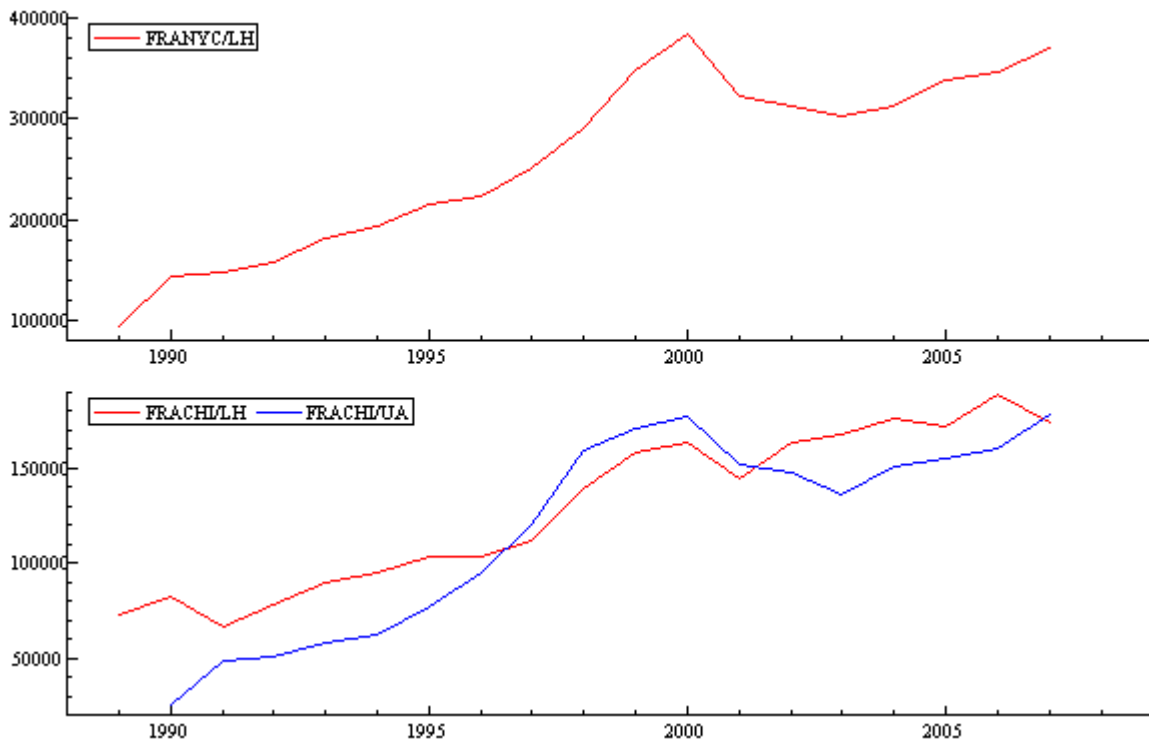


Figure 9: Comparing traffic changes in parallel and complementary structures in the LH/UA case

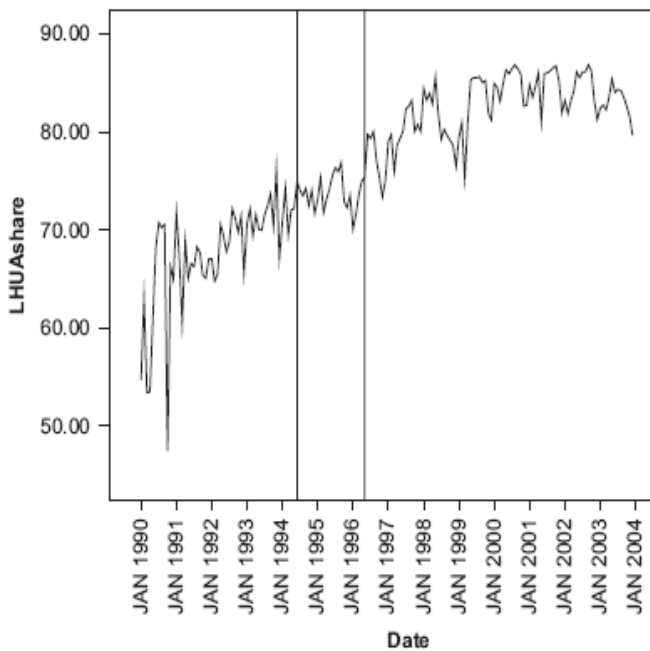


Figure 11: LH/UA alliance market share, FRA-ORD 1990-2003

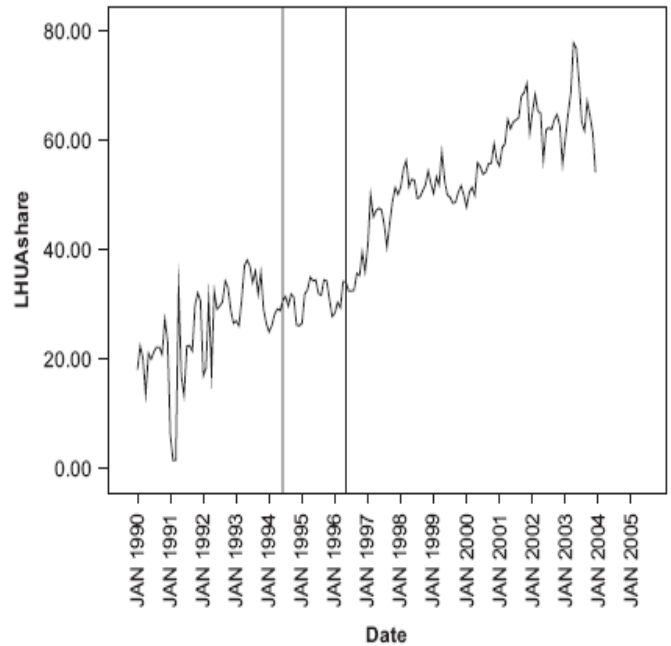


Figure 10: LH/UA alliance market share, FRA-JFK 1990-2003

Source: Pitfield (2007)

The BA/USAir code-share agreement initiated in 1993 was soon dissolved. This can partly explain the relatively modest increase in BA's passenger levels. In addition, an important consideration may be formed by comparing traffic levels of BA and rival airlines during the timespan of 1989-2007. The traffic between London-US market is far higher than Amsterdam-US and Frankfurt-US, respectively. This may indicate that airlines serving routes between London-US face more fierce competition in comparison to carriers in the Amsterdam-US and Frankfurt-US markets. An intriguing point of view is illustrated in figure 12 where the upper graph depicts passenger traffic development for BA versus their rivals (excluding VS). The lower graph depicts the situation where BA/AA would merge against rivals. It is evident, as shown in the upper graph, that BA has the largest market shares compared to rival carriers. However, even though BA/AA would merge, as shown in the lower graph, there still exists high level of competing carriers serving the sample routes between London and the US. Therefore, a valid point when evaluating which carriers receive antitrust immunity should focus on market concentration. Albeit, the anti-competitive concerns acute in the BA/AA case concentrated on the amount of parallel service on many routes between major US cities and London, the majority of such traffic could be far less than in the LH/UA case. This situation can be illustrated by comparing traffic levels, and more specifically competition

concentration, in figure 8 (LH/UA vs. rivals) and the lower graph in figure 12 (BA/AA vs. rivals). The idea of the illustration is to show how BA and AA face more competition between London and the US cities than LH and UA between Frankfurt and the US. Moreover, as there are no results showing decreasing passenger levels in the LH/UA parallel market, it may be taken into consideration when evaluating the many parallel structures in the BA/AA case. This said, a noteworthy discussion could be placed on the fact that if BA and AA would engage in cooperation it would give them a monopolistic layout in some routes. For example, currently, passengers flying from Heathrow to Dallas have no choice but to travel with a member of the One World alliance. Nevertheless, the anti-competitive apprehension may be avoided by neglecting BA/AA the right to cooperation on routes with monopoly characteristics.

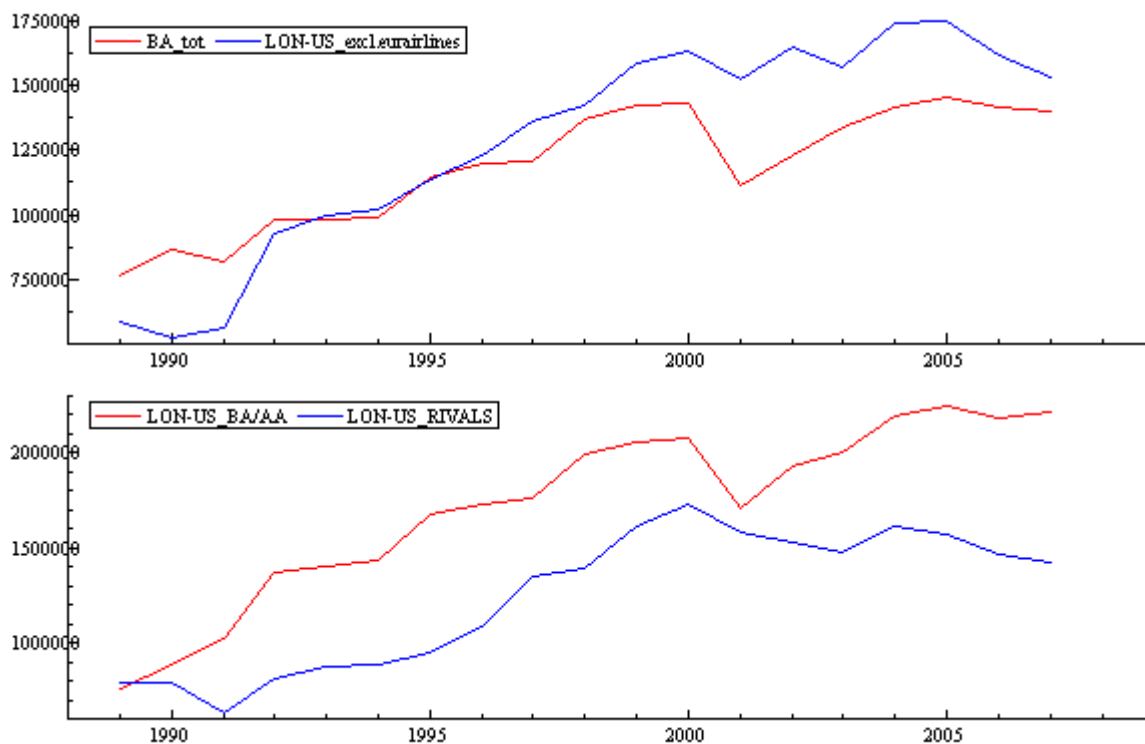


Figure 12: Trans-Atlantic Traffic with BA versus competitors and traffic levels where BA/AA would merge against competitors

I consider it to be interesting that rivals of both NW/KL and BA have been able to increase traffic, in the gateway market, more than the two alliances individually (from table 2). Taking separately and with respect to rivals, these two alliances do not incline to have constituted for increasing passenger levels as a result of code-sharing and immunity. The reason, however, may stem from the fact that this research compares alliance traffic to aggregated rival passenger figures. Therefore,

because of the nature of panel data, route-specific and carrier-specific effects need to be controlled for. In order to compare partner alliance traffic changes with those on non-partner carriers, a regression model is going to be presented in section 7. Yet, before approaching the econometric issues, some results from the Finnair case can be drawn. The next subsection analyses therefore Finnair's passenger output development before and after code-sharing and antitrust immunity settlements, respectively.

7.4 Results based on overall traffic changes in the Finnair case

Finnair and American Airlines are not going to be included in the regression model. Nevertheless, I believe that some interesting information can be found based on traffic changes during the periods before and after code-sharing and antitrust immunity, respectively.

Table 3. shows Finnair's overall traffic changes on the non-stop HEL-JFK market, Finnair's long-haul routes, and SAS overall traffic changes over Stockholm (ARN)- New York (EWR) segment. Finnair may not, in my opinion, be compared directly to carriers such as LH, KLM and BA, because of firm size. The trans-Atlantic traffic levels for Finnair is far less than those of LH, KLM, and BA. Thus, I find it more interesting and realistic to compare trans-Atlantic traffic changes between the two Nordic carriers AY and SAS, and subsequently including Finnair's aggregated long-haul market as benchmark for trans-Atlantic development. The aim by benchmarking AY with SAS, is to capture any indications of higher passenger levels for AY after establishing code-sharing and antitrust immunity agreement with American Airlines.

Route	Alliance partners	P1	P2	P3	ΔQ_{p2}	ΔQ_{p3}	Q_{p1}	Q_{p2}	$\frac{\Delta Q_{p2}}{Q_{p1}}$	$\frac{\Delta Q_{p3}}{Q_{p2}}$
			Code-Share	Antitrust immunity						
HEL-JFK	AY/AA	1989-1999	2000-2002	2003-2006	-3420	2885	90969	80729	-0,038	0,036
Long-haul	AY				53333	11750	140500	244000	0,038	0,458
ARN-EWR	SK				3380	6227	99524	94416	0,034	0,066

Table 3: Finnair's Traffic changes between hub airports

In table 3, all passenger level data consider traffic changes for the periods 1989-1999, 2000-2002, and 2003-2006, respectively. These periods reflect Finnair's pre-alliance period in P1, code-sharing period in P2, and Antitrust immunity in P3. From table 3, passenger traffic volumes have increased on the HEL-JFK route during the antitrust immunity period and decreased during the code-sharing period compared to the benchmark period 2 and 1, respectively. By comparing key figures of period 3, Finnair increased other long-haul sector passenger levels by 45,8% compared to traffic in period 2. This has to be taken though with due consideration because AY capacity on Asian long-haul

routes have increased from nine departures per week in 2000 to 59 departures in a week in 2007²⁴. After receiving antitrust immunity, Finnair were able to increase passengers by 3,6% compared to code-sharing period. When comparing code-sharing period to pre-alliance period 1, passenger volume dropped by 3,8% in the HEL-JFK segment. During code-sharing period, Finnair's aggregated long-haul sector grew by 3,8%. These figures do not support increasing passenger volumes as a code-sharing result. SAS (SK) increased volumes in period 2 compared to period 1 by an average of 3,4%. However, comparing trans-Atlantic passenger volume data from period 3 with respect to period 2, SAS increased passenger volumes almost twice as much as Finnair. Although Finnair passenger volumes soared on average in period 3 compared to period 2 where they decreased on average, period 2 had far more passengers than during period 3. This shift is, however, characterized of a snail's pace, not consistent with preceding code-sharing research. These results do not support the assumption that antitrust immunity in the Finnair case would have resulted, intrinsically, in increasing passenger levels. On the contrast, this may show signs that after code-sharing and antitrust immunity was granted, passenger volumes decreased on the HEL-JFK segment.

From figure 13, comparing traffic changes and departures performed, SAS experienced quite a dramatic dip on its passenger levels starting from quartile 2 in 2005, and departures have only decreased slowly. In contrast, comparing data of 2004 to 2006, Finnair has increased departures and also slowly increased its overall passenger levels. This shows that Finnair has managed to keep higher passenger levels with respect to departures compared to SAS. Further, this conceivably indicate that Finnair has been more efficient than SAS²⁵. This result, however, does not suggest that the efficiency is due to code-sharing.

24 The data is gathered from Finnair's annual reports during the timespan of 2000-2007

25 This holds based on that there has not been a shift if aircraft size and seats available for neither SAS nor AY. By looking at data from DOT, one can state that there has not been changes in aircraft type.

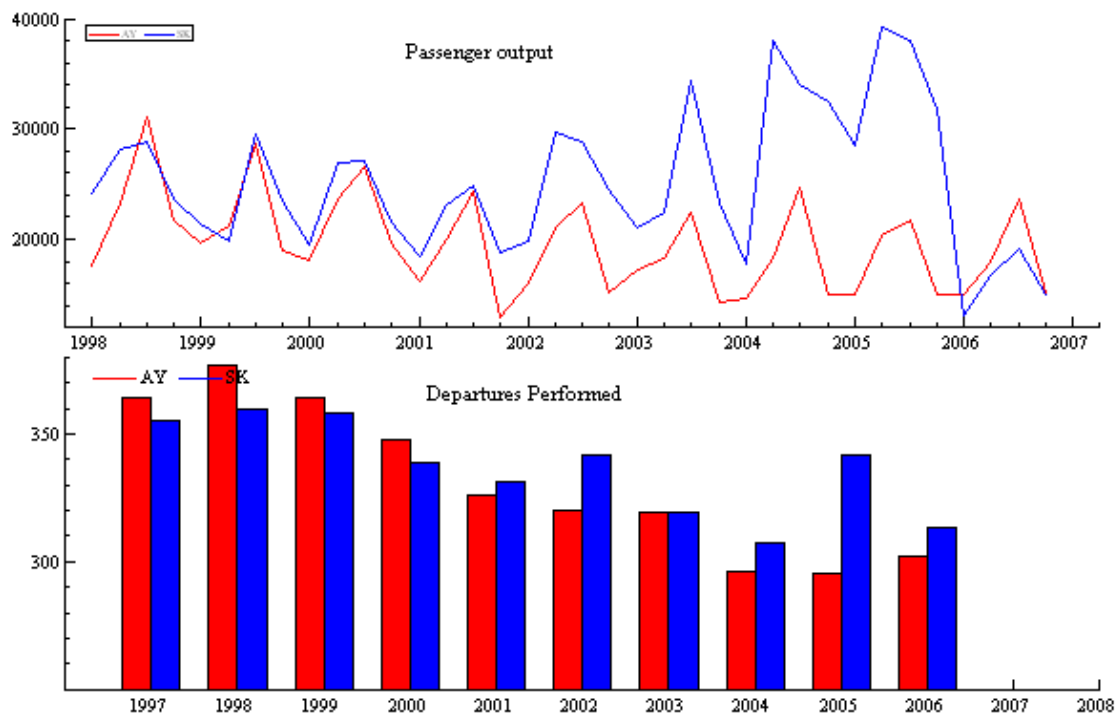


Figure 13: Hub-to-hub passenger output and departures performed (one way AY: HEL-JFK & SK: ARN-EWR)

The results on Finnair's traffic changes are to some extent dubious to suggest that traffic increase can be explained by code-sharing and/or antitrust immunity. For one, the reason stems from the fact that as the generated data can not distinguish between connecting and non-stop passengers, there are no truly definitive contributions. Secondly, what could be the reasons for not finding evidence that Finnair increased total traffic as expected under code-sharing? First, Finnair's strategy has not concentrated on the trans-Atlantic market. We can observe, by looking at table 3, that most of the capacity has been directed to the East Asian market. Then by some reasoning Finnair is bound by capacity constraint, not being able to focus on the trans-Atlantic market. Secondly, some support may be found by the fact that the amount of departures performed differ between the respective periods. Figure 14, depicts clearly that the amount of Finnair's yearly passenger volumes and yearly amount of departures performed between HEL and JFK have decreased after the code-share contract was created in 1999. The amount of trans-Atlantic passengers have dropped from close to 85.000 passengers in 1999 to around 70.000 passengers in 2007. This effect does not incline that there would be greater demand for trans-Atlantic travel, and thereby significantly more passenger traffic over the HEL-JFK segment. Therefore, in my view, there are no consistent evidence showing that Finnair have strategically used code-sharing and antitrust immunity in order to increase traffic levels.

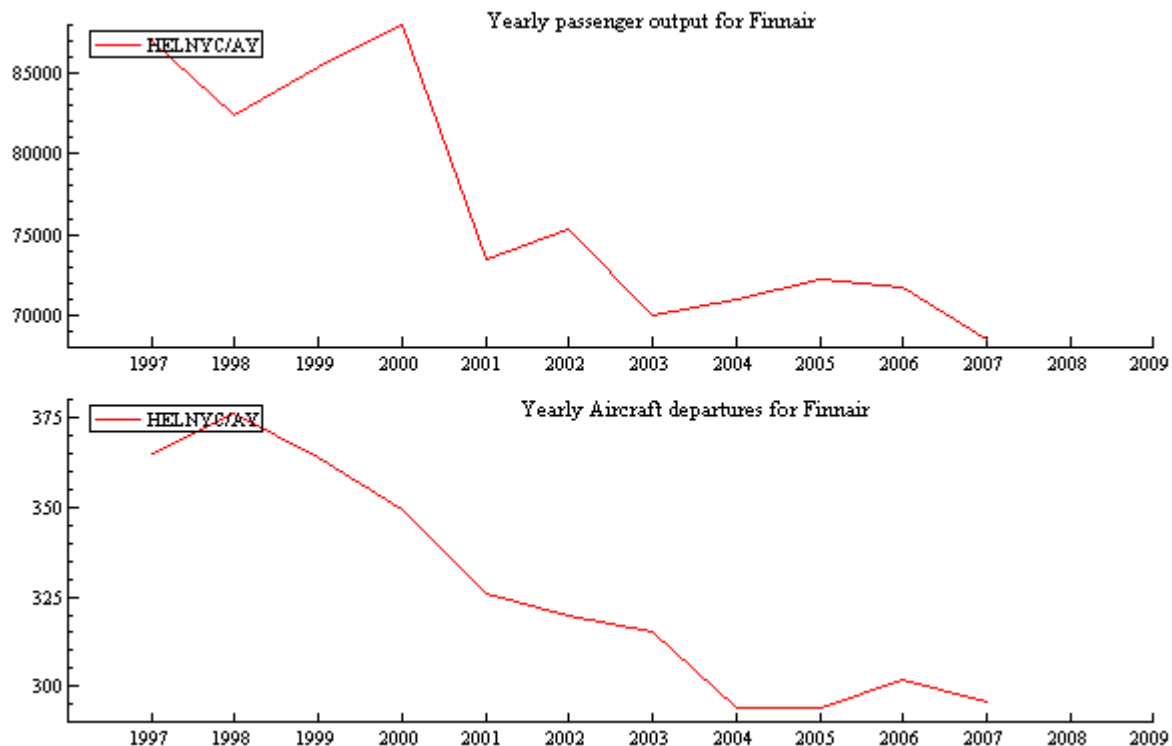


Figure 14: Finnair's passenger levels and departures performed during the timespan of 1997-2007

When comparing traffic changes in table 2 and 3, and more specifically the code-sharing effect, we fail to find similarities in the AY/AA alliance compared to the LH/UA case. Various reasons can help explaining some of the dissimilarities. First, Finnair operates a monopoly market between HEL-JFK and LH/UA operate mostly in parallel with competitors between FRA-US. An oligopoly market leads to a higher level of competition (Cabral 2000). Secondly, the consumer demand and passenger density is far higher between FRA-ORD than between HEL-JFK. Finally, when Finnair's strategy has been highly concentrating on the East-Asian market, the trans-Atlantic market is expected to suffer from capacity constraint.

Furthermore, when an airline operate under monopoly it may price-discriminate more efficiently. This because in monopoly markets the operating carrier does not have to consider, to the same extent, decisions of other airlines on how to allocate capacity between connecting and non-stop passengers. Therefore, in monopoly markets the carrier can basically focus merely on the non-stop route. Why try to wheedle connecting passengers if the necessary demand and highest yield can be received from non-stop passengers?

Results show that Finnair has been able to increase passenger levels after receiving antitrust

immunity compared to code-sharing, and passenger levels dropped in the code-sharing period compared to pre- alliance period. Nevertheless, from table 4, Finnair has increased its load factor from an yearly average of 74% in pre- alliance i.e. period 1, to post- alliance of 78% in period 2 and 81% in period 3, respectively. As a result, as no other airline compete on non-stop route, HEL-JFK, the alliance partners (in this case Finnair) can “artificially” hold up or keep up fares by holding back on capacity growth. As characterized in monopoly markets, this situation may end up with shortage of seats and create means of extracting higher yields and load factors at the same time (Doganis 2001). The results from the Finnair case may support the above.

Year	Load AY
1997	74%
1998	76%
1999	72%
2000	78%
2001	74%
2002	81%
2003	74%
2004	81%
2005	83%
2006	83%

Table 4: Finnair’s load factor between HEL-JFK

8 Econometric Issues

A number of of econometric issues unveil due to the nature of the panel data. This section deals with statistical issues stemming from the methodological approach. Of these, the most significant are functional specifications, estimation method, appropriate treatment of error structures, and specification of fixed effects. The following sub sections address these questions.

8.1 The choice of data structure

The choice of data structure depend largely on what we like to investigate. As this research gathered data on different airlines through time, the logical approach is to use a panel regression. A panel regression analyses several individuals through time. Thereby, the analysis is organized in a two-dimensional setting which captures both the time-series dimension and the cross-sectional dimension. This enables capturing any changes on alliance output compared to non-alliance traffic changes through time. Thereby, a panel approach may capture group effects, time effects, or both (Park, 2008).

Some consequences emerge. Data can be analysed on monthly, quarterly, and yearly basis. Regardless of the approach the picture that emerges is complex. Amongst other things, capacity on the route samples examined here is changed both by the incumbent airlines and carriers leaving and entering the market. This causes traffic volumes to fluctuate. As this paper uses only a small sample, some of the route effects may not be captured. For example, the main traffic for each of the alliance pair are operated between strategically important hub airports, which differ between alliances. Thus, excluding strategically important city-pairs, may offset the estimation results from actual, real world, outcomes. This incorporates structural differences among sample routes. Consequently, all those factors which are constant for a specific alliance route are constant over time but differ across alliance routes. In addition, concerns on how to capture all those factors which influence each of the carriers, e.g. shift in business cycles remains. In order to control for the above mentioned factors a two-way effect model is used, which have two sets of dummy variables for groups (specifications are provided in 8.3).

The one-way model includes only one set of dummy variables (e.g. firms). The approach in this thesis relies on the so called “*two way Least Squares with Dummy Variables*” (Hence referred as simply LSDV), where two sets of dummy variables are considered, e.g. firm and year (Park 2008). The advantage with LSDV stems from the fact that it manages to divide individual alliances in groups, and thereby compares the alliance “groups” with code-share and antitrust immunity against those of non-alliance and non-cooperative groups. This enables capturing any development between groups that collude with those that do not. Thus, rendering possible for a comparison between alliance partners with non-alliance carriers, and the passenger volume development before and after code-sharing and antitrust immunity.

8.2 The LSDV approach

To control for the data collection on non-partner carriers firm size, I restricted the data in the analysis to the largest non-partner airlines on the route. The total number of observation for partner alliance traffic and the largest non-partner airlines are 323 and 260, respectively. The traffic on the respective city-pairs were broken into their one-way components i.e. the observations consists of traffic from European gateway cities to U.S. gateway cities.

When including a regression based on dummy variables and an intercept, the presence of a “dummy variable trap” occur. This is due to the reason that the regression equation is not solvable since X matrix is not fully ranked. However, to avoid the problem of multicollinearity when running a

regression analysis with multiple dummy variables, three approaches may be used. The first is running OLS with all dummy variables, ignoring intercept. The second omits one of dummy variables and includes the intercept. The final includes all dummy variables and the intercept, but enforces a restriction that the sum of parameters of all dummies are zero (Park 2008).

The regression analysis in this thesis relies on the second approach, where the model omits one dummy variable set for airline, and route, respectively. Thus, the intercept is the coefficient of the dropped dummy variable category, playing the role of baseline or reference point. Other coefficients are differences of the baseline from corresponding actual coefficients. For example, the intercept 325.539, in Table 5, is the actual coefficient of the dropped dummy variable. The coefficient -266.769 for FRA-CHI is interpreted as $266.769 - 325.539$ indicating negative increase relative to route LON-NYC, which is the reference point. Nevertheless, the traffic on route FRA-CHI has in fact increased. If different dummy categories are omitted the results may end up with different parameter estimates and different standard errors of the variables. However, the coefficient of code-share and antitrust immunity remain quite the same.

Nevertheless, as stated earlier the route-and carrier- specific effects need to be controlled in order to compare traffic changes on alliance airlines (routes) on those of non-alliance airlines (routes). Therefore, a regression is conducted, following the variable description.

8.3 Variables

The theoretical approach in the methodology is influenced by the fact that there is no possibility to capture route specific effect in the omitted variables that, in this model, are considered constant over time. Indeed, there is no possibility to capture the carrier-specific effect utility concerning e.g. management style, fleet composition, population in a hub city, frequent flyer benefits, frequencies of flight, or any other “value added” characteristics that could capture unobserved heterogeneity. Instead of including these characteristics as variables in the model, I assume them to be embedded in the carrier specific dummy variable. The unobserved heterogeneity also rises because of the supply-and-demand simultaneity problem due to time aggregation and market equilibrium. “That is, a regression on quantity on prices can not be interpreted as a demand equation because we could expect an unobservable exogenous shift in demand to affect not only purchases but also prices through the supply side effect of quantities on prices” (Arellano, 2003). Though the example above does not give a thorough perception with regards to my model, it forms the intuition of unobserved heterogeneity.

The unobserved heterogeneity, in my model, arises due to differences among the sample routes in omitted variables. Thus, I use the approach of Park et al. (2001), where in order to control for inter-route heterogeneity, authors include dummy variables for each route in the regression model. Thus, the model includes a dummy variable for each period in order to control for period-specific effects i.e. pre-alliance period as reference for code-sharing period, and code-sharing period as reference for code-sharing induced by antitrust immunity. However, the dummy specific period indicating code-sharing and antitrust immunity differ across alliances depending on code-sharing and antitrust immunity settlements. This approach is conducted due to the theoretical concern of treating any changes in the dependent variable that are unmeasurable and constant for all the sample routes but that change across years.

Theoretical concerns are dealt with according to the above discussion. Subsequently, a presentation of the regression analysis follows.

8.4 Regression with Dummies

The regression is performed with a set of unbalanced data. The model is formalized as follows:

$$Q_{pijt} = \beta_0 + \beta_1 CS + \beta_2 PIMM + \beta_3 PCS + \beta_4 CA_i + \beta_5 RTE_j + \varepsilon_{pijt} \quad (6)$$

where Q_{pijt} is carrier i 's annual passenger traffic, p , on route j in time index t . For the test of pre- and post- alliance effect on total adjusted "market shares"²⁶, the respective adjusted market shares of each airline and route were used for dependent variables in (6) instead of total passenger levels,

$$Q_{pijt}.$$

The dummy variable for CS, PCS and PIMM are the main concerns of this investigation, and measures the negative (positive) effect of code-share, parallel alliance, and immunity on passenger output, respectively. The specification for the CS is the total code-share alliance traffic, PCS is the effect of an parallel alliance, and PIMM for antitrust immunity, respectively. The CS takes value 1 when a alliance form code-share agreements and otherwise 0. The parallel alliance take the value 1 when the route is characterized by a parallel alliance and otherwise 0. The PIMM takes the value 1 when antitrust immunity were granted to an alliance and otherwise 0. The PIMM measures the induced passenger volume effect of antitrust immunity compared to code-sharing. CA_i introduces

²⁶ Market shares are calculated on aggregated sample basis. Following this interpretation total yearly travel on the total trans-Atlantic market is divided by year, route, and carrier basis. Thus, this adjusted aggregated market share approach differs from traditional research, where market shares are calculated as total traffic on specific route(s) divided by carrier specific traffic levels operating that/those route(s).

dummy variables for each carrier which controls for carrier-specific effect. The dummy variables for route specific effect, RTE_j , is designated to capture demand differences that are unmeasurable and constant for all airlines that serve a route, but vary between routes. The differences across routes, *ceteris paribus*, may occur for example due to bilateral agreements or Opens Skies settlements. In order to avoid perfect multicollinearity, two dummy variables are omitted, one from each set i.e. one dummy variable for route and airline are dropped. The route London-New York and American Airlines, are used as a base route, a base airline, respectively. I consider the ε_{pij} as an i.i.d error term with zero mean and constant variance.

The model in eq (6) does not include dummies for year specific effect. The reason to this conduct stems from the consideration of the relatively small sample size. I try to be parsimonious by minimizing the number of dummy variables due the the low number of observations. If the model includes dummy variables to capture year effects, it loses degrees of freedom i.e. the number of values in the model that are free to vary. By not including year dummy variables, I avoid the the problem of many parameters in a small sample size. Thus, I try to hit the highlights, focusing on the main argument; the negative (positive) effect of code-sharing and antitrust immunity. However, results including year specific effects are included in appendices²⁷.

8.4.1 Hypotheses

Hypotheses are formed in order to answer the research question. These help clarifying the econometric aims. Hypotheses are often used in statistics to indicate that no statistical significance exists in a set of given observations. Therefore, the null hypothesis attempts to show that no variation exists between variables, or that a single variable is no different than zero. The null hypothesis is presumed to be true until statistical evidence can indicate otherwise i.e. reject the null in favor for an alternative hypothesis. Moreover, statistical testing does not prove hypotheses; rather it disproves them via rejection at different significance levels. The null hypothesis is usually expressed in the form: no relationship exists between the dependent (Y) and the independent variable (X) (Wooldridge, 2006).

The econometric testing in this thesis attempts to investigate the effect of alliance formation. First, I aim at finding evidence to suggest that code-sharing increase traffic levels. In addition, I investigate whether antitrust immunity enhance that effect. Finally, in order to identify conditions under which

²⁷ When including year specific effects the equation (6) takes the form

$Q_{pijt} = \beta_0 + \beta_1 CS + \beta_2 PIMM + \beta_3 PCS + \beta_4 CA_t + \beta_5 RTE_j + YR_t + \varepsilon_{pijt}$ where YR_t represents year-specific effects.

economic welfare will likely improve, the model distinguishes between parallel and complementary alliance. Thus, may parallel alliance cause negative attributes? Accordingly, the null hypotheses on passenger levels are formed as follows:

Hypothesis 1: Code-sharing

H_0 : Code-sharing does not increase passenger levels.

H_1 : Code-sharing increases passenger output.

Hypothesis 2: Antitrust immunity

H_0 : Immunized alliances are not associated with increasing output.

H_1 : Antitrust immunity enhance positively passenger output.

9 Empirical results

This section presents the estimation results. The section is divided in two parts. First, a presentation of results on total traffic levels are presented. Secondly, results from the regression on adjusted “market shares” are shown. A number of publications have examined alliance impact. These investigations show positive impact tendencies on both traffic on a route and on market shares of alliance members, and that the impact is even greater if the members hub at gateway airports (Pitfield 2007).

The model consisting of equation (6) is estimated using LSDV for unbalanced panel data. The estimation results are provided in Table 5. The LSDV approach examines the difference of the baseline intercept from actual intercept. Thus, an important aspect considers that parameter estimate of American Airlines and route New York is presented as the intercept (325.539). Other dummy parameter estimates are computed relative to the reference point. The actual intercept of the route FRA-CHI, for example, is computed as $325539 + (-266769)*1 + (-254333)*0 + \dots + (-392419)*0 = 58770$, where 325539 is the reference point. Consequently, the dummy coefficients indicate how far its parameter estimates are away from the reference point or baseline (i.e., the intercept). From table 5, the overall goodness of fit, R^2 , for the regression on total traffic and adjusted market shares are relatively high with values 83,2% and 88,3%, respectively. All of the route specific

estimates are considered to be significant at the 1% level, even though negative with respect to the reference point.

9.1 Regression results investigating passenger levels

The left hand side of Table 5, show test results for the empirical estimation on traffic levels. Most of the dummy variables are found significant at least at the 1% level. More importantly, the coefficients of PCS, CS and IMM are all positive, even though antitrust immunity is only bound to be significant at the 10% level. Thus, following the results, the null hypothesis for code-sharing can be rejected at the 1% level. However, we fail to reject the null at 1% level in the antitrust immunity case. These result estimates suggest that code-sharing has a positive effects on traffic levels. Following the code-sharing settlements, airlines have been able to increase total traffic by an average of 55.466 of the average baseline reference point. Estimates shows that antitrust immunity is positively correlated to passenger levels. Interestingly, in contrast to previous literature parallel alliance shows positive effect. Investigating total traffic, the three cooperation measures in this thesis induce positive attributes.

However, including year specific dummy variables shifts vastly the results on traffic levels. From appendix C, the regression on traffic level shows that including year specific dummy variables, using 1990 as the baseline, causes the estimates of code-sharing, parallel alliance, and antitrust immunity becoming highly insignificant. In sum, based on total traffic, no robust findings are contributed.

9.2 Regression results investigating market shares adjusted for aggregated levels

Instead of using the common previous research formulation, namely, solely using passenger levels as the dependent variable indicator for code-sharing effect, this research introduces a different approach.

The impact of alliance formation on market concentration and competition can also be analysed by controlling market shares for aggregated passenger levels. Therefore, this research focuses on the aggregated adjusted market share data to find negative or positive traffic level estimates caused by code-sharing and immunity, respectively. The regression on market shares are constructed with respect to total traffic. I have divided traffic by each route, airline and year with aggregated yearly sample traffic. As a result, yearly variation in passenger volumes are treated for, and year effects are

eliminated. The benefit occurs as this enables to control for external effects. Accordingly, estimations are expected to produce more stochastic measures than that of the total traffic regression, used commonly.

When comparing the aggregated adjusted markets shares, estimation in table 5 shows significant and negative result for the code-sharing period implying reducing passenger level effects relative to market shares during the pre-code-sharing period. Adding year specific effect in the regression (see appendix D) show that code-sharing stays negative, whilst insignificant. As a result, we fail to reject the hypothesis that code-sharing does not increase passenger levels. These results suggests that code-sharing derive negative effects on passenger levels. This is surprising and in conflict with previous research (for example Pitfield (2007)).

From table 5, parallel alliance shows negative effect at the 10% level of significance. Adding year specific effects (se appendix D), the parallel alliance estimates turn out positive and insignificant. However, this research suggest that these results on parallel alliance should be taken with due consideration due to accessing only few observations.

In contrast to code-sharing results, table 5 estimate positive immunity effect on passenger levels with respect to market shares adjusted for aggregated levels. Moreover, unlike code-sharing estimate, immunity variable remains positive when adding year specific effects (see appendix D). The estimate of immunity only changes slightly when year specific effects are include. In addition, the t-statistic only changes slightly, merely above the 5% level of significance. Therefore, the hypothesis that immunized alliances are not associated with increasing output can be rejected at the 5% and 10% levels, respectively. As a result, the positive effect of code-sharing stays inconclusive, in fact, suggesting a negative impact on passenger levels. On the opposite, results in both tests find immunity significant, reflecting a positive impact on traffic levels.

In addition, using London as reference point, appendix E show that code-sharing is negative and highly significant, and antitrust immunity positive and significant. By including year specific effects and excluding period 2000-2007 parameter estimates on code-sharing and immunity retain negative and positive signs, respectively, whilst producing insignificant results²⁸. In addition, results on immunity is in line with findings in the constructive estimation in section 7.3. Conclusively, the proposition that granting antitrust immunity for these alliances causes positive attributes may well

²⁸ In order to conserve space, the year specific effects using London as reference point is not included in appendices. However, these can be obtained up on request.

bee supported and indeed justified from authority perspective.

Variables	<u>Total traffic</u>		<u>Market shares</u> <u>adjusted for</u> <u>aggregated levels</u>	
	Estimate	<i>t</i> -stat	Estimate	<i>t</i> -stat
CS	55465,5	3,04***	-0.00640	-2.61***
IMM	29135,4	1,68*	0.004707	1.97**
PCS	109813	8,76***	-0,00343	-1,67*
FRA-NYC	0.00000		-0,01042	-1,47***
FRA-CHI	-266769	-2,41***	-0.05354	-5.41***
FRA-IAD	-254333	-20.2***	-0.03819	-4.45***
FRA-ATL	-333631	-9.53***	-0.05160	-5.65***
FRA-MIA	-262449	-20.9***	-0.03209	-3.03***
LON-CHI	-324174	-2,32***	-0.06691	-2.44***
LON-IAD	-164389	-3,01***	-0.03371	-7.27***
LON-ATL	-308648	-8.82***	-0.02747	-4.72***
LON-MIA	-250242	-7,08***	-0.05137	-5.44***
AMS-NYC	-233844	-6.68***	-0.01914	-3.29***
AMS-CHI	-282058	-1,65***	-0.05948	-1.68***
AMS-IAD	-345469	-19.7***	-0.05311	-18.3***
AMS-ATL	-392419	-11.2***	-0.04651	-8.00***
LH	-14148.9	-21.4***	0,00060	0,309
UA	-788.500	-6,42***	-0.00037	-6,46***
KL	32183.4	1.84*	0,00900	3.10***
NW	0.000000			
BA	5674.99	0.19	-0.00120	-1,09
VS	20130	2,99***	0.00616	7.99***
CO	-197163	-2,65	-0.03805	-4.57***
DL	129973	3.71***	0,01200	1,73***
CONSTANT	325539	14,41***	0.067485	1.94***
OBSERVATIONS	583		583	
R^2	0,8316		0,883	

Table 5: The estimation results on total traffic and market shares adjusted for aggregated levels

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

10 Discussion

Findings using adjusted “market shares” are to some extent controversial with respect to code-sharing expectations. In fact, if two airlines merge their relative market shares should decrease. Thus, code-sharing may decrease total traffic measured in market shares. Moreover, measured as departures, market shares are likely to increase due to the advantage of economies of scope. If airlines are able to allure more traffic via code-sharing, they may need more departures between gateway routes. However, if airlines take advantage of economies of traffic density, they may increase passenger levels by using planes with larger capacity. Consequently, even though passenger traffic soars, the amount of departures and market shares stay equal (using departures as index). In addition, when competition authorities grant antitrust immunity, they often require alliances to relinquish slots at hub airports. This should lead to decreasing market shares. Nevertheless, this can only be approached indirectly due to ambiguous conclusions in accordance with theory, expectations, and empirics.

The restricted access to data has not provided this paper perfect tools for making an extensive analysis on code-share effect and antitrust immunity. In fact, considering the limited data, it would be somewhat simplistic to state that findings in this study could suggest some managerial implications. Nevertheless, this study finds interesting results. As a supplement to previous research, this thesis performed estimations on code-sharing and antitrust immunity using adjusted aggregated data in order to partially control for error structures. The approach used in this thesis find results not in accordance with previous research. However, using the results as a generalization may be viewed as relatively drastic measure. One reason for this study to differ from previous literature is the route sample. As this thesis only uses 14 different routes and specific airlines, the findings rely on this data backing up the investigation. Therefore, the results may differ if research are conducted relying on different route samples. As a result this thesis suggests that relevant focus should be concentrated on routes included in the data sample. For example, the access to only two different parallel alliances, constitutes impediments assessing real world consequences. Therefore, some of the results should be taken with due consideration. In addition, existing error structures may cause ambiguous estimates. The following section presents some of these issues.

10.1 Emerging error structures

This thesis uses data consisting of yearly traffic observations. As discussed in previous sections emerging data utilization problems are complex, for amongst other things, capacity on the principal routes examined here is changed by both the incumbent airlines and airlines leaving and entering

the market and this causes traffic volumes to fluctuate. The level of integration between carriers may also differ through time. For example, US has negotiated bilateral agreement with one country at the time, and this influences the traffic outcome. Accordingly, the effect of opens skies and bilateral agreements are not included in these estimates. Consequently, non-stationary and autocorrelation in the residuals may cause some problems. Autocorrelation indicates pattern of correlations through time and cause non-randomness. Thus, an observation is related to an adjacent observation. Autocorrelation tests has not been performed in relation to the estimation of eq. (6). Nevertheless, if there exists autocorrelation, which is likely, it would constitute different estimation approach. In order to manage autocorrelation, dynamic models should be used. Indeed, treating dynamic models for autocorrelation falls outside the frame of this thesis.

Non-stationarity in regression represents another problem distorting estimation results. Specific test for stationarity has not been performed in conjunction with the estimation. This may influence the risk of treating non-stationary series in the model. This violate fundamentals in time-series models. However, using adjusted “market shares” (treated for yearly variations and eliminating total variation in traffic volumes) as dependent variable instead of total traffic should allay the risk of non-stationarity.

10.2 Further analysis and extended research exhortation

The basic rationale with a complementary alliance enables partners to attract more passengers as a result of extension in networks size. Accordingly, it remains an interesting avenue to investigate whether complementary alliance affects negatively non-alliance output. If complementary alliance affects adversely on rival carriers’ output, it possibly entice non-alliance airlines seeking strategic partners to increase network size and defend market shares. This conduct could consequently lead to sequential game settings where ultimately the competition would take place between alliances. Do there exist a prisoner’s dilemma when comparing alliance formations with non-alliance? If the complementary alliance affects negatively on non-partners output and profits, the non-partner would perhaps seek for a strategic partner to feed traffic on international routes. Consequently, other airlines may start merging as an intention for increasing profits and defending market shares. Eventually, when most airlines form alliances, could the situation thus be worse than if non of the airlines would have merged in the first place? I consider this dilemma as an interesting avenue to investigate.

Previous literature suggest that as an international alliance are granted antitrust immunity, they may

collude more generally (Brueckner and Whalen 2000). This could also be of an interest for further research, namely does alliance members with antitrust immunity cooperate more extensively with each other than other members of the alliance? Lastly, this thesis find it worthy to introduce theoretical and empirical work acute in the BA/AA case. This could be examining parallel alliance routes where partners face competition from non-alliance carriers.

11 Concluding remarks

For the past decades the aviation industry has been developing towards a more global and integrated market. The growing air travel sector is of topical concern, and therefore makes it an interesting subject to investigate, namely, evaluating competition and strategic cooperation between airline alliances in the general market place.

A significant development, after international aviation deregulation, is using code-sharing, allowing partners to sell seats on each other's flights. In addition, alliance partners may be granted antitrust immunity, enabling mutual price-setting and traffic coordination on some routes.

This thesis aims at assessing the effect of code-sharing and immunized alliances on passenger levels. Specifically, this study attempts to identify the conditions under which economic welfare likely improves. By yearly panel records for the 1989-2007 period, between three different European hubs connecting to five US points of entry, this thesis uses mainly two different empirical models. First, using total traffic levels as dependent variable, and subsequently "market shares" adjusted for aggregated levels.

Testing total traffic with the hypotheses that code-sharing does not increase passengers and immunity diminishes code-sharing effect, can be rejected. Thus, the effect on traffic levels shows, like previous literature, that code-sharing and antitrust immunity associates with increasing passenger levels. In addition, the parallel alliance estimates are found, somewhat surprisingly, positive. Consequently, the expectation that parallel alliance should have resulted in lower passenger levels may have been incorrect. However, these results are not found significant when adding year specific effects.

The results in testing the effect on "market shares" adjusted for aggregated levels shows that code-share and parallel alliance impose negative estimates, significant at the 1% and 10% levels, respectively. By including year specific effects code-sharing remain negative. In addition, code-

sharing stays negative and highly significant when using passenger traffic between London-US as reference point. Conclusively, all tests using adjusted “market shares” as dependent variable, found negative code-share effect. Consequently, increasing market shares conceivably decrease traffic output in the code-sharing period. Therefore, this paper finds it legitimate to question whether code-sharing be viewed as welfare enhancing.

On the contrary, based on “markets shares” adjusted for aggregated levels, antitrust immunity appears positive and significant in all tests, suggesting that antitrust immunity grants likely increase traffic levels. Thus, this thesis finds it supportive and robust to suggest that granting immunity for these alliances is justifiable from a welfare perspective.

However, some of the estimation results need to be taken with serious consideration. First, limited access to data composes restrictions in performing an extensive generalization on strategic alliance, particularly, code-sharing as a strategic device: the sample size is simply too small. Moreover, the thesis refers to the discussion of error structures when judging estimations reliability.

Finally, this paper explains that code-sharing in monopoly structures on the trans-Atlantic route may result in merely modest passenger increase. The non-stop segment between HEL-JFK is solely operated by Finnair. Consequently, the problem with monopoly structures arises when carriers are able to keep up fares by holding back on volume supply (Doganis 2002). Following the above, this paper suggests that such an advantage may have caused Finnair extracting higher yields and load factors at the same time. However, other explanations should be considered as well. Finnair’s slow traffic development on the trans-Atlantic route may stem from capacity constraints. Therefore, as Finnair concentrates strongly on the East Asian market, it restrains from focusing on the trans-Atlantic markets.

Svensk sammanfattning av avhandlingen (Swedish summary of the thesis)

Sammandrag

Flygbranschen karakteriseras som en av de mest reglerade industrier i världen. Flygbolag måste anpassa sig i enlighet med regionala, nationella och internationella regleringar som styr verksamhetens karaktär. Från och med 1980-talet har flygbranschen varit på väg mot mer etablerade strukturer. Den pågående integrationen mellan flygbolag belyser vissa viktiga frågor angående utfall till följd av flygbolagsallianser. Flygbolagsallianser framträder i många olika former beroende på graden av integration. De mest framstående typer av integrationsgrad är gemensam linjebeteckning (code-sharing) och antitrust-immunitet. Code-sharing innebär att ett flygbolag sätter sin egen bolagskod på en flygning som genomförs av ett annat flygbolag. Detta är ett sätt för flygbolag att genom samarbete med andra flygbolag expandera sitt linjenät och marknadsföra sig på linjer de inte själva flyger. Antitrust-immunitet möjliggör för en allians att samverka lagligt bl.a. genom gemensam prissättning och uppgörelse om trafikvolym. Alliansrutter har av både parallella och kompletterande karaktär. Den förstnämnda avser sträckor där flygbolagen tävlade före alliansen och den senare där partners kopplar upp nätverk för att ”mata” trafik till varandra. Denna avhandling syftar till att analysera de positiva och negativa egenskaper till följd av allianser på den transatlantiska marknaden. Mer specifikt försöker avhandlingen med hjälp av empirisk undersökning och en utökad version av den traditionella empiriska implementeringen avgöra huruvida code-share har orsakat positiva (ökade) passagerarvolym och därefter om anslagsbeviljandet av antitrust-immunitet leder till ytterligare ökning. Med paneldata (på årsnivå) som omfattar tidsperioden 1989-2007 och inkluderar 15 olika rutter på den transatlantiska marknaden jämför avhandlingen passagerarvolym för code-sharing allianser med antitrust-immunitet i förhållande till utomstående flygbolag på enskilda rutter. Tonvikt i den empiriska delen av forskningen läggs på att analysera passagerar förändringar med hjälp av att bygga upp en modell som beaktar justerade aggregerade marknadsandelar som en väsentligt beroende variabel.

Genom att använda den traditionella modellen, där totala passagerarvolym används som den beroende variabeln, visar undersökningens resultat att code-sharing ökar passagerar mängden, vilket är i enlighet med tidigare forskning. Denna avhandling hävdar att dessa resultat må vara beroende av statistiska testegenskaper. Genom att korrigera passagerar volymen utgående från aggregerad nivå för enskilda rutter, verkar det som om code-sharing framkallar negativa attribut i förhållande till passagerar mängden. Antitrust-immunitet uppskattas i avhandlingen som positiv och signifikant i de flesta testen, vilket tyder på att myndigheternas beviljande av antitrust-immunitet för dessa

allianser anses vara försvarbart. Vidare finner avhandlingen, med en konstruktiv uppskattning, att antitrust-immunitet i LH/UA fall inte nödvändigtvis är paretooptimalt. För ett mer övertygande försvar kräver påståendet emellertid ytterligare data och mer grundläggande analys. Slutligen hävdar avhandlingen att code-sharing i monopol-nätverk lätt till att flygbolagen möjligtvis lyckats öka både belägningsfaktorn och avkastningen till följd av hejdandet av code-sharing kapacitetens tillväxt.

Introduktion

Under de senaste årtiondena har den internationella flygtrafiksindustrin övergått stegvis till en mer befriad marknad. Emellertid är flygbranschen än ett av de mest restriktiva och reglerade branscher inom internationell handel. Flygbolagen är fortfarande bundna till att trafikera under flera olika förordningar och föreskrifter (nationella, regionala och internationella). Dessa hinder begränsar flygbolag att flyga var de vill, vilket innebär att det är nästan omöjligt för enskilda flygbolag att etablera omfattande globala nätverk. Begränsningar för utländskt ägande och nuvarande bilaterala avtal utgör hinder för frihandel inom luftfarten. Därför har konsumenternas preferenser och konkurrens mellan tävlande flygbolag snabbt lett till att transportörer bildat strategiska allianser.

Efter avregleringen av den amerikanska flygindustrin år 1978 har några större formella förändringar utvecklats. I början av 1980-talet påbörjade de flesta internationella flygbolag trafikera enligt den så kallade nav-eker-nätverket²⁹ (hub-and-spoke), där passagerarna koncentreras på en viktig knutpunkt där de väntar på att överföras till slutdestinationen. Under 1990-talet utvecklades en ny strategisk formation: strategiska internationella allianser mellan två eller flera flygbolag. Den mest utmärkande egenskapen i en allians är utvecklingen av gemensam linjebeteckning, sk. code-sharing. Code-sharing kombinerar operativa tjänster i minst två olika flygbolag och tillåter parterna att sälja biljetter på samarbetspartners flyg. Följaktligen används code-sharing för att integrera verksamheten med strategiska partners för att bilda globala servicenätverk.

Utan en allians fastställs biljettpriser genom strategisk samverkan som bygger på att varje flygbolagen skilt väljer biljettpriser för de flygsegment som de trafikerar. Enskild prissättning, utan samarbete, leder till en negativ externalitet, dubbelmarginalisering (Tirole 1998). Om konkurrensmyndigheterna beviljar alliansen med antitrust-immunitet, möjliggör det för parterna att kringgå dubbelmarginaliseringen. Således anges helhetspriser med fokus på gemensam vinst. Denna form av vertikal integration, med code-sharing och antitrust-immunitet, förväntas leda till lägre priser, större passagerarvolym och förbättrad passagerarförmån (Brueckner 2000).

²⁹ Systemet syftar på nav och ekrar där hub är navet dit alla spokes, ekrar, bär.

Det finns klara fördelar av att bilda allianser men code-sharing kan också ses som ett redskap för att minska konkurrensen mellan flygbolag. Om två flygbolag innan alliansen ansågs konkurrera på specifika rutter får lagligt rätt till prissättnings- och volymsamarbete kan de förmodligen öka gemensam kombinerad marknadskraft. Dessutom kan flygbolag som samarbetar genom code-sharing pris-diskriminera mellan passagerare med direkt flyg och förbindelseflyg. Den förväntade inverkan på marknaden spelar en särskilt stor roll när konkurrensmyndigheterna beslutar om godkännande eller begränsande av allianser.

Förenta staternas transportministerium (US Department of Transportation (DoT)) har tagit den slutliga positionen i att bevilja immunitet i konkurrensärenden mellan amerikanska och utländska flygbolag, vilket är unikt för flygsektorn. Innan DoT godkänner immunitet för allianser får de rekommendationer från Förenta staternas justitieministerium (US Department of Justice (DoJ)), som utreder alliansen för eventuella antitrust-kränkningar. Intresset för att övervaka och begränsa allianser härrör från grundläggande oro över rättvis konkurrens och passagerarvälfärd.

Det finns både kostnader och fördelar förknippade med allianser. Dessa klassificeras vanligen i parallella och komplementära nätverk. Det senare hänvisar till två flygbolag som kopplar upp nätverk för att mata trafik till varandra medan det tidigare till ett samarbete där två flygbolag, innan alliansen, var konkurrerande flygbolag på vissa linjer. Därmed studerar denna avhandling två typiska alliansstrukturer: kompletterande och parallella.

Frågan om allians bildning är av högaktuellt intresse i och med att Europeiska kommissionen nyligen inlett en undersökning för konkurrensbegränsande förfarande av allianser mellan flygbolag. Ena utredningen gäller det befintliga och planerade samarbetet mellan Star Alliance-medlemmar United Airlines (UA) och Lufthansa (LH). Den andra innebär föreslagna samarbetet mellan medlemmarna i One World alliansen, nämligen British Airways, American Airlines och Iberia³⁰.

Denna avhandling studerar olika allianser med syftet att bevisa huruvida code-sharing och antitrust-immunitet ökar passagerar nivåer efter att flygbolag bildat allianser. Fyra olika allianser studeras: Lufthansa / United Airlines, KLM / Northwest Airline, British Airways / USAir och Finnair / American Airlines samt utomstående flygbolag som fungerar som kontrollgrupp. Genom årliga

30 <http://www.telegraph.co.uk/finance/newsbysector/transport/5189914/European-Commission-adds-to-turbulence-over-BAAA-tie-up.html#>

paneldata observationer som omfattar tidsperioden 1989-2007 försöker denna avhandling svara primärt på frågan om code-sharing och antitrust-immunitet bidrar till ökande passagerarvolym. Ytterligare försöker avhandlingen finna möjliga indikationer som skulle innebära oro på grund av allians bildning. Avslutningsvis bedrivs en formell bedömning om huruvida code-sharing och antitrust-immunitet, från ett generellt perspektiv, kan anses vara välfärds befrämjade.

Som en följd av begränsad data och möjlig snedvridning på grund av datahantering hävdar undersökningen att resultaten tas med vederbörlig hänsyn. Oavsett diverse problem kategorier finner avhandlingen giltiga och viktiga resultat enligt följande.

Genom att använda totala passagerar mängden som den beroende variabeln är avhandlingens resultat i linje med tidigare forskning d.v.s. code-sharing kan förknippas med ökande passagerar nivåer. Avhandlingen påstår att ovanstående sammanhang kan bero på statistiska test egenskaper. Med en modifierad modell, som kontrollerar trafiken för aggregerade passagerarvolym för år-och ruttnivåer, ifrågasätter avhandlingen giltigheten av den positiva code-share effekten.

Avhandlingens statistiska test tyder på att passagerar mängden ökar som en följd av antitrust-immunitet. Detta resultat tillför ytterligare bevis på att immunitet bidrar till ökande passagerarvolym. Som en följd av resultaten anser uppsatsen det välgrundat och motiverat att konkurrens myndigheterna beviljat antitrust-immunitet för dessa allianser. När totala trafiken används som den beroende variabeln tycks trafikintensiteten öka på parallella rutter. Genom att kontrollera för aggregerade rutt specifika nivåer tyder resultaten snarare tvärtom. Detta kan tolkas som att förväntningarna om att parallella alliansers minskar trafiken förblir ofullständiga. Utöver de erhållna resultaten visar den utförda konstruktiva uppskattningen tecken på att anslagsbeviljande av antitrust-immunitet till Lufthansa/United Airlines kunde tolkas som icke paretooptimalt inom vissa rutter. Detta innebär att trafikökningen på rutter som stimuleras av immuniteten för LH/UA ha kunnat eventuellt minska trafiken för deras konkurrenter på dessa rutter. Ett mer entydigt stöd för påståendet kräver förmodligen ytterligare analys med mera vidsträckt data och betraktas som en intressant fråga med tanke på fortsatt forskning. Slutligen undersöks ett monopol-nätverk med den slutsatsen att flygbolag som trafikerar utan direkt konkurrens på vissa rutter kan utnyttja gemensam linjebeteckning för att utöka samtidigt vinsten och beläggingsfaktorn genom hejdandet av code-sharing kapacitetens tillväxt.

Syfte

1. Denna uppsats undersöker effekten av code-sharing och antitrust-immunitet på den transatlantiska marknaden. Mer specifikt svarar avhandlingen på frågan om code-sharing utökar flygbolagets passagerarvolym och ytterligare om antitrust-immunitet sporrar ökningseffekten.

2. Med original-/primärdata över tidsperioden 1989-2007 analyserar avhandlingen specifika USA-EU rutter genom att jämföra trafikvolym för allians och icke-allians flygbolag.

Tidigare forskning

Före 2000-talet var litteraturen om flygbolagsallianser gles. Under det första decenniet av 2000 har ekonomister och forskare funnit några intressanta resultat förknippat med code-sharing och strategiska allianser. Merparten av forskningen omfattar både teoretiska och empiriska arbeten. Bland teoretiska fynd utreder Park (1997) kompletterande och parallellt allians för biljettpriser, vinst, kvantitet och välfärd. Författaren visar att välfärden ökar i kompletterande nätverk. Däremot minskar välfärden på parallella rutter. Park och Zhang (1998) undersökte allianseffekten genom att jämföra trafikvolym för allians och icke allians. Författarna visar att alliansen leder till ökande passagerar nivåer för flygrutterna mellan ”gateway” (hub-till-hub) städer. Effekten framkallas oftast då partners länkar flera rutter till gateway staden. Park, Zhang och Zhang (2001) gjorde empiriska test som baserade på teoretisk ram och undersökte komplementära och parallella transatlantiska rutter med data för åren 1990-1994. Resultaten visar att rutter som kompletterar sannolikt ökar passagerar mängden och parallella minskar den totala passagerar mängden. Den kvantitativa analysen visar ett genomsnitt på 11-17% ökning av passagerar mängden i kompletterande nätverk medan parallella allianser minskar den totala trafiken med ett genomsnitt på 11-15%. Brueckner och Whalen (2000) gjorde en empirisk duopol-allians utredning om inverkan av allians gällande priser före och efter code-sharing överenskommelser. Författarnas resultat visar att icke-allians prissättning påverkas av dubbelmarginalisering som mildras vid användning av code-sharing. Whalen (2007) breder ut ovanstående analys med hjälp av 11-års paneldata om internationell trafik mellan USA och Europa (tredje kvartalet varje år mellan 1990-2000). Han fann att allianser med antitrust-immunitet kan förknippas med 13% till 20% lägre priser än traditionella interline biljettpriser. Vidare fann undersökningen att code-sharing priser är 5% till 9% lägre än interline priser. Whalen (2007) beräknade att tillsammans medför immuniserade allianser 51-77% och code-sharing 29-41% högre passagerarvolym.

Metod och data

För den empiriska delen av avhandlingen samlades data från ICAO (International Civil Aviation Organization) Traffic by Flight Stage (TFS) databas. Antalet flygbolag för undersökningens 15 olika rutter erhöles avhandlingen också från ICAO:s databas. Alliansrutter identifierades i huvudsak med hjälp av uppgifter från ICAO. För uppgifter om alliansen och i syfte att fastställa huruvida alliansen var en där parterna kunde samverka lagligt kontaktade jag en konsult från ICAO, London. Transatlantiska data samlades för fyra olika europeiska knutpunkter (hub) som är anslutna till fem olika amerikanska knutpunkter. Eftersom data består av olika flygbolag och allianser över tiden har undersökningen panelregister för flygningar över Atlanten för tidsperioden 1989-2007. Tre allianser beaktas: British Airways-USAir (endast 1993-1996), Northwest-KLM, Lufthansa, United Airlines.

Genomförandet av undersökningen

Code-sharing och dubbelmarginalisering

Avhandlingens empiri bygger starkt på teorin om dubbelmarginalisering. Den dubbla marginaliseringen genererar ett ineffektivt utfall som uppstår när det finns fler än ett företag i den vertikala distributionskedjan där var och en har incitament att införa påslag över marginalkostnaden för produktens pris. Dubbelmarginaliseringen utgår från att ett monopol i tillverkningsledet av en vara säljer vidare till ett monopol i återförsäljarledet. En sekvens av påslag leder till högre konsumentpriser och sänker kombinerad vinst för båda företagen i distributionskedjan. Detta har oftast negativa sociala konsekvenser. Genom att integrera företagen kan dubbelmarginaliseringen potentiellt undvikas.

Den bakomliggande tanken med code-sharing relaterar till att undvika dubbelmarginalisering. Istället för att maximera företagets enskilda nytta kan fusionerade företagen sälja flera produkter än vad gjorde de två oberoende företagen. På så vis är vinsten i de integrerade företaget större än vinsten för de två ensamstående företagen. Då producerar företaget mer och produkt priset blir lägre vilket givetvis leder till att alla drar nytta genom integrationen av de två monopolistiska företagen. Som resultat förväntas sammanslagningen öka social välfärd (fler kvantiteter blir sålda med lägre pris och vinsten för sammanslagna företaget ökar).

Den ovan beskrivna situationen kan tillämpas i fallet med code-sharing där två flygbolag och passagerare gynnas genom att integrera kompletterande nätverk. Som illustration kan vi anta att en resenär vill flyga från Helsingfors (HEL) till Los Angeles (LAX). Det finns inga direkt flyg mellan

ovanstående destinationer. Utan ett code-sharings avtal måste resenären köpa två olika biljetter t.ex. först en biljett av Finnair (AY) från HEL till New York (JFK) och en annan biljett av American Airlines (AA) från JFK till LAX. Genom code-sharing kan exempelvis en resande från HEL till LAX få en flygbiljett utställd av Finnair med två AY-flygnummer för en resa som först går från Helsingfors till JFK med ett AY-plan och därefter sker flygningen mellan JFK och LAX med AA-plan till slutdestinationen. Då finns det ett code-share avtal mellan JFK-LAX med Finnair och American Airlines.

Code sharing-avtalet täcker alla världsomspännande flyglinjer som man gemensamt kommit överens om. Parterna strävar efter att samordna bättre transferanknytningar och förbättra kapacitetsutnyttjandet av sina respektive flygbolags trafiknät för att på så sätt utveckla bättre förbindelser mellan och bortom deras hemmamarknader, samt för att minimera väntetider vid mellanlandningar.

Antitrust-lagstiftning

Om en flygbolagsallians beviljas antitrust-immunitet kan flygbolagen pris- och volymsammarbeta. Dessutom möjliggör den strategiska samordningen att utveckla ömsesidiga prisformuleringar på vissa marknader och snabbt ändra priserna enligt marknadsmässiga villkor. I princip tillåter immunitet förbättrad integration utan rättsliga efterspel från konkurrenterna. Således bidrar immunitet mer eller mindre till att flygbolagen kan slås samman som ett enda flygbolag. På grund av nationell lagstiftning och äganderätt förblir flygbolagets ledning dock åtskilda. När antitrustmyndigheter beslutar om att tillåta antitrust-immunitet jämför de för- och nackdelar med att skapa en sådan konkurrens fördel. Före DoT ger beslut om att begränsa eller bevilja immunitet i konkurrensärenden får de rekommendationer från DoJ som utreder code-sharing förslag för potentiella antitrust-kränkningar. Ändå har DoT tagit sig rätten att ifrågasätta alla förslag från justitiedepartementet. Därför har DoT den slutgiltiga rätten att godkänna antitrust-immunitet

Estimering

Genom konstruktiv undersökning jämför avhandlingen passagerar trafiken för allians- och icke-allians flygbolag på den transatlantiska marknaden. Syftet med forskningen är att jämföra passagerar mängden före code-sharing perioden med code-sharing perioden och antitrust perioden med code-sharing perioden för att finna täcken på att respektive ”konkurrensfördelar” bidragit till ökade passagerarmängder. Undersökningen visar täcken på att code-sharing har lett till ökade passagerar mängder. Vissa farhågor kan också tas fram. Resultaten för antitrust-immunitet perioden i LH / UA fall visar att anslagsbeviljandet av antitrust-immunitet har minskat LH/UA:s

konkurrenters passagerarvolymerna på de rutter där LH/UA samarbetade. Således kan immunitet i LH/UA-fallet lätt till en situation som inte anses vara paretooptimal. Detta innebär att fast antitrust-immunitet har lett till ökade passagerarmängder för LH / UA har det på samma gång möjligtvis orsakat avtagande trafik för deras konkurrenter (vissa rutter). På basen av estimeringen gör avhandlingen inga generella slutsatser om varken code-sharing eller immunitet. Snarare påpekar undersökningen att hänsyn kunde riktas mot marknadskoncentration när det gäller anslag av immunitet. Som ett exempel kunde påpekas att fast BA och AA styr merparten av trafiken mellan London (LHR) och USA är konkurrensen på många av dessa rutter mer aggressiv än t.ex. trafiken mellan Frankfurt (FRA) och USA³¹. Således ifrågasätter avhandlingen varför BA/AA är de enda flaggskeppen i en global allians som inte har beviljats antitrust-immunitet.

Vad gäller monopol-nätverk verkar det som om Finnair skulle ha minskat på passagerarmängden under code-sharing-perioden samtidigt som företaget ökat beläggingsfaktorn. Detta kunde tyda på att Finnair lyckats utnyttja code-sharing och immunitet för att samtidigt höja biljettpriser och öka beläggingsfaktorn.

Ekonometrin

Ett antal ekonometriska frågor uppstår på grund av utformningen av paneldata. Bland dessa behandlas statistiska frågor som härrör från undersökningens metod. Av dessa diskuterar avhandlingen funktionella specifikationer, beräkningsmetod och behandling av tillförlitlighet. Analysen är organiserad i en två-dimensionell inställning som fångar både tidsserie och tvärsnitt-dimension. Detta ger möjligheten att fånga förändringar när allians och icke-allians passagerartrafik jämförs med varandra. Därmed kan panelmetoden fånga grupp-effekter, effekter över tiden eller båda (Park 2008). Oavsett vilken metod som används framträder det vissa egenskaper som kräver hänsyn. Bland annat ändras kapacitet både av etablerade flygbolag och flygbolag som lämnar och kommer in på marknaden på sträckorna som undersöks. Detta orsakar trafikvolymerna att fluktuera. Eftersom denna avhandling använder ett relativt litet urval kan en del av rutt-effekter inte fångas. Till exempel är det viktigt att förstå att trafiken mellan strategiskt viktiga ”hubbar” skiljer sig mellan allianser. Således kan exklusive strategiskt viktiga rutter leda till att uppskattningens resultat avviker från verkliga värden. Därmed är alla de faktorer som är konstanta för en viss allians rutt konstanta över tiden men kan variera mellan olika allianslinjer. För att kontrollera för ovan nämnda faktorer används en tvåvägs-effektmodell, som har två uppsättningar av dummyvariabler.

31 Däremot finns det också vissa rutter som på grund av BA/AA-sammanslagningen skulle ge bolagen monopolställning.

Vidare använder den utvidgade modellen i uppsatsen passagerar nivåer för varje rutt och flygbolag som är justerade för aggregerad årsvolym. För att kunna kontrollera för rutt-, flygbolag- och årsspecifika effekter inkluderas dummyvariabler för att representera ”individuell” effekt. Dessutom, i motsats till tidigare forskning kontrollerar uppsatsen delvis för estimerings fel genom att titta på aggregerade nivåer.

Variabler

I traditionella allians undersökningar används årliga totala passagerarvolymen som den beroende variabeln. Istället för totala passagerar volymen använder avhandlingens modifierade modell justerade marknadsandelar som den beroende variabeln. För code-share perioden används dummyvariabel som tar värdet 1 då code-sharing avtalet trädde i kraft och annars 0. Den parallella alliansen tar värdet 1 när färdvägen präglas av en parallell allians och annars 0. Perioden för immunitet har värdet 1 när antitrust-immunitet beviljades en allians och i övrigt 0. För att kontrollera flygbolag-specifika effekter inkluderas en dummyvariabel för varje flygbolag. Fortsättningsvis utses en dummyvariabel för varje rutt för att fånga skillnader i efterfrågan som är omätbara och konstanta för alla flygbolag som bedriver en rutt och för att fånga variationen i efterfrågan mellan olika linjer. För att undvika perfekt multikollinearitet utlämnas två dummyvariabler, en från varje uppsättning d.v.s. en dummy variabel för rutt och flygbolag har uteslutits. Feltermen i den ekonometriska modellen representerar alla de variabler som påverkar passagerar volymer men som inte ingår i modellen explicit: ”unobserved”.

Resultat

När totala passagerar volymen används som den beroende variabeln återstår de flesta av dummyvariablerna som betydande åtminstone på 1%-nivå. Koefficienterna för parallella rutter, code-sharing och immunitet är alla positiva, även om antitrustimmunitet är signifikant endast på 10% nivå. Resultaten kunde tolkas som att både code-sharing och immunitet leder till ökade passagerar mängder. I motsats till tidigare litteratur visar resultaten positiv effekt för parallella rutter. Genom att inkludera år-specifika effekter uppskattas code-sharing, parallell allians, och antitrustimmunitet som insignifikanta.

Istället för att använda den övergripande forsknings modellen inför denna avhandling ett annat tillvägagångssätt.

Effekterna av code-sharing och antitrustimmunitet kan också analyseras genom att kontrollera

marknadsandelar för aggregerade passagerare nivåer. Därför fokuserar denna forskning på aggregerade justerade marknadsandel för att finna negativa eller positiva trafik skift som orsakas av code-sharing och immunitet. Regressionen om marknadsandelarna är konstruerade med avseende på den totala trafiken. Avhandlingen har delat trafik för varje rutt, flygbolag och år med den sammanlagda årliga sampel trafiken. Som resultat av ovanstående behandlas årlig variation i passagerarvolymerna med den konsekvensen att år-effekter elimineras. Fördelen uppstår eftersom det möjliggör att kontrollera för externa effekter. Följaktligen förväntas estimaten producera mer stokastiska resultat än den totala trafik regressionen. Till min kännedom har denna form av code-sharing undersökning inte använts i tidigare forskning.

Resultaten för de sammanlagda justerade marknadsandelarna visar signifikanta och negativa resultat för code-sharing perioden vilket kan tolkas som att code-sharing minskar passagerar nivåer i förhållande till perioden före code-sharing. Genom att lägga till år-specifika effekter i regressionen visar estimaten att code-sharing förblir negativt. Som ett resultat kan inte hypotesen om att code-sharing inte ökar passagerare nivåer förkastas. Detta resultat kan tyda på att code-sharing härleder negativa effekter på passagerar mängder.

Resultaten med hänsyn till parallella allianser tyder på negativ effekt. Genom att lägga till år-specifika effekter blir estimaten positiva men insignifikanta. Med tanken på att avhandlingen hade tillgång till endast få observationer för parallella allianser bör resultaten vidtas med vederbörlig hänsyn. Som övergripande slutsats anser avhandlingen att resultaten för parallella allianser förblir ofullständiga.

I motsats till code-sharing resultat uppskattas immunitet leda till ökade passagerar nivåer. Till skillnad från code-sharing förblir immunitet variabeln positiv när år specifika effekter inkluderas. Som övergripande slutsats tyder resultaten på att code-sharing minskar passagerar volymer och anslagsbeviljandet av immunitet ökar passagerar volymer. På basen av resultaten drar avhandlingen den slutsatsen att code-sharing inte kan tolkas som välfärdsbefrämjande. Till motsats finner avhandlingen bevis på att anslagsbeviljandet av immunitet kunde antas öka välfärden.

Avslutning

Genom gemensam linjebeteckningen eller code-sharing kan allianser sälja platser på varandras flygningar. Denna form av integration möjliggör en allians för att tjäna globala marknader, och kringgå nationella och internationella hinder.

Denna avhandling undersöker frågor om allians bildandet i syfte att bedöma om utnyttjandet av code-sharing och immuniserade allianser ökar trafikintensiteten. Med hjälp av panel-data för perioden 1989-2007 studeras tre olika allianser som jämförs med utomstående flygbolag. Konkret försöker denna studie identifiera de förhållanden under vilka ekonomiska välfärden kan förbättras.

Undersökningen jämföra två olika empiriska metoder och finner resultat enligt följande. Genom den traditionella undersökningen testas avhandlingen totala passagerar volymen med hypotesen: code-sharing leder inte till ökade passagerar mängder, som kan förkastas. I enlighet med ovanstående visar testen att anslagsbeviljandet av antitrust-immunitet utökar passagerar mängden. Ovannämnda resultaten överensstämmer med tidigare forskning. Ytterligare studerades parallella allianser där resultaten kan eventuellt tolkas något överraskande, positiva. Följaktligen kan förväntningen om att parallella allianser leder till krympande passagerar mängder ha varit felaktig. Genom att lägga till år-specifika nivåer förfaller resultaten insignifikanta.

Genom att avgå från den traditionella undersöknings metoden använder denna avhandling aggregerade marknadsandelar justerade för år- och rutt-effekter som beroende variabeln. Resultaten på code-sharing och parallella alliansen inför negativa estimat signifikanta på 1% respektive 10% nivå. Alla test med den utvidgade modellen tyder på att code-sharing skulle förhålla sig negativt till passagerar mängden. Med andra ord skulle code-sharing leda till minskade passagerarvolymen. Under dessa omständigheter, ifrågasätter denna avhandling ifall code-sharing kan ses som välfärds befrämjande. Tvärtom tycks antitrust-immunitet förhålla sig positivt i flesta testen, vilket tyder på att antitrust-immunitet bidrar till ökad passagerarintensitet. Sålunda finner denna avhandling att anslagsbeviljandet av immunitet för dessa allianser är försvarbart ur ett välfärds perspektiv.

På grund av problem kategorier bör dock en del av uppskattningens resultat tas med viss försiktighet. Avhandlingen identifierar olika problemkategorier som eventuellt kunde leda till snedvridning i resultaten. Bland annat komponerar den snäva tillgången till data begränsningar i att utföra en omfattande generalisering om strategisk allians, i synnerhet, code-sharing som en strategisk enhet: urvalsstorleken är helt enkelt för knapp. Även om detta innebär att resultaten inte förespråkar generaliserbara slutsatser bidrar avhandlingen med viktiga propositioner som kunde anses som tänkbara i fortsatt forskning. Med tanke på övergripande slutsatser hävdar avhandlingens resultat att effekten av code-sharing möjligtvis beror på undersöknings metod.

Ytterligare undersökte avhandlingen segmentet mellan HEL-JFK som uteslutande drivs av Finnair. Det kan uppstå problemet med monopol strukturer i fall där transportörerna kan hålla upp priserna genom att hejda volym utbudet (Doganis 2002). Följaktligen finner avhandlingen det möjligt att Finnair, genom att använda ovannämnda fördel, lyckats utnyttja code-sharing för att nå högre beläggingsfaktor och eventuellt högre biljettpriser genom hejdandet av code-share kapacitetens tillväxt. Även andra förklaringar kan övervägas. Finnairs långsamma trafikutveckling på den transatlantiska rutten kan bero på kapacitet begränsningar. Eftersom Finnairs strategi fokuserar starkt på den östasiatiska marknaden har det tämligen kunnat begränsa bolaget från att fokusera på den transatlantiska marknader.

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Appendix A: FREEDOMS OF THE AIR

First Freedom of the Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State or States to fly across its territory without landing (also known as a First Freedom Right).

Second Freedom of the Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State or States to land in its territory for non-traffic purposes (also known as a Second Freedom Right).

Third Freedom of The Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State to put down, in the territory of the first State, traffic coming from the home State of the carrier (also known as a Third Freedom Right).

Fourth Freedom of The Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State to take on, in the territory of the first State, traffic destined for the home State of the carrier (also known as a Fourth Freedom Right).

Fifth Freedom of The Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State to put down and to take on, in the territory of the first State, traffic coming from or destined to a third State (also known as a Fifth Freedom Right).

ICAO (International Civil Aviation Organization) characterizes all "freedoms" beyond the Fifth as "so-called" because only the first five "freedoms" have been officially recognized as such by international treaty.

Sixth Freedom of The Air - the right or privilege, in respect of scheduled international air services, of transporting, via the home State of the carrier, traffic moving between two other States (also known as a Sixth Freedom Right). The so-called Sixth Freedom of the Air, unlike the first five freedoms, is not incorporated as such into any widely recognized air service agreements such as the "Five Freedoms Agreement".

Seventh Freedom of The Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State, of transporting traffic between the territory of the granting State and any third State with no requirement to include on such operation any point in the territory of the recipient State, i.e the service need not connect to or be an extension of any service to/from the home State of the carrier.

Eighth Freedom of The Air - the right or privilege, in respect of scheduled international air services, of transporting cabotage traffic between two points in the territory of the granting State on a service which originates or terminates in the home country of the foreign carrier or (in connection with the so-called Seventh Freedom of the Air) outside the territory of the granting State (also known as a Eighth Freedom Right or "consecutive cabotage").

Ninth Freedom of The Air - the right or privilege of transporting cabotage traffic of the granting State on a service performed entirely within the territory of the granting State (also known as a Ninth Freedom Right or "stand alone" cabotage).

Source: Manual on the Regulation of International Air Transport (Doc 9626, Part 4)

Appendix B: DEFINITIONS, ABBREVIATIONS, AND COMMON AIRLINE TERMS

Cabotage rights

Cabotage in aviation is referred to the right of the carrier from one country to operate inside of the domestic borders of an other country. If Finnair has a flight from Helsinki that stops at New York and continues on to Los Angeles, it would not be allowed to on board passengers from New York to Los Angeles if that violated U.S. cabotage regulations. Only those passengers boarded in Helsinki could be carried to Los Angeles.

Code-share

An arrangement whereby a marketing carrier's code is used to identify a flight operated by another carrier. The marketing carrier may make reservations and issue tickets for the operating carrier's flights.

DOT

Department of Transportation in the U.S.

Frequent Flier Program (FFP)

The FFP is a loyalty program where the passenger has the opportunity to collect points on a specific airline program according to distance flown or the booking class in which the passenger travels. The passenger can then use the collected points in order to e.g. upgrade between booking classes, book free flight and inflight purchases.

Mark-up

The gap between marginal cost and the actual price the firm charges is called mark-up. When two firms in a vertical supply chain, facing a downward sloping demand curve, mark-up over marginal cost it is called double marginalisation.

Hub- and- spoke

Hub and spoke distribution system refers to a network where all routes move along spokes, passing through a central hub.

Interlining

Interlining is the acceptance of one airline to issue travel documents by another airline for carriage on the service for the first airline. Interlining gives the right to issue a travel document on the same ticket though there are the operational services of two separate airlines.

Load factor

The passenger load factor is the revenue passenger-kilometers (RPKs) expressed as a percentage of available seat kilometers (ASKs). This is often simplified by taking the number of passengers carried as a percentage of available seats for sale, on a single sector.

Point-to-point

In a point- to- point distribution system a plane travels directly from origin to destination rather than going through a central hub.

Revenue Passenger Kilometers (RPK)

The RPK of an airline is the the sum of the products obtained by multiplying the number of revenue passengers carried on each flight stage by the flight stage distance - it is the total number of kilometers traveled by all passengers. RPK is a measure of sales volume of passenger traffic i.e. a measure of airlines passenger traffic.

Segment

A segment is defined as take-off and landing between a city-pair or airport pair.

Slot

A slot at an airport is the right to operate one take-off and landing at that airport within a fixed time period.

Sub-fare

A “sub-fare” is referred to as when two firms in the same supply chain makes an individualized pricing decision, and does not take into consideration the impact it has on the other firm’s demand.

Yield

The passenger yield is referred as the average revenue per passenger kilometer, and is calculated by dividing the total passenger revenue with total passenger kilometers.

AIRLINE INDICES AND AIRPORT CODES

AY= Finnair
AF= Air France
SK= Scandinavian Airlines
LH= Lufthansa
UA= United Airlines
KL(M)= Royal Dutch Airline
NW= Northwest Airline
BA= British Airways
AA= American Airlines
VS= Virgin Atlantic
DL= Delta Airlines
CO= Continental Airlines

HEL= Helsinki
ARN= Stockholm (Arlanda)
FRA= Frankfurt
AMS= Amsterdam
LON/LHR= London (Heathrow)
JFK/NYC= New York (John F Kennedy)
ORD/CHI= Chicago (O’Hare)
MIA= Miami
IAD= Washington, DC
ATL= Atlanta

Appendix C: Regression estimates on total passenger traffic including year specific effects

Total traffic					
Variables	Estimate	t-stat	Variables	Estimate	t-stat
CS	4192,82	0,166	YR89	-7108.93	-1.03
IMM	-3073.03	-0,161	YR91	-3668.97	-0.447
PCS	-21455,5	-0,865	YR92	18939.1	1.64
FRA-NYC	152636	2,480***	YR93	24631.1	1.95*
FRA-CHI	-53525	-4,75***	YR94	26887.1	1.21
FRA-IAD	29571.0	1.19	YR95	40394.9	1.78*
FRA-ATL	-44412.7	-8.25***	YR96	44403.7	1.95*
FRA-MIA	0.000000		YR97	60305.1	2.42**
LON-CHI	-45319.1	-2.33***	YR98	73948.9	2.81***
LON-IAD	45209.7	3.74***	YR99	92633.8	3.44***
LON-ATL	-19429.5	-3.25***	YR00	99653.5	3.58 ***
LON-MIA	-40643.1	-3.36***	YR01	74627.9	2.83***
AMS-NYC	34854.5	5.62***	YR02	80731.8	2.99***
AMS-CHI	-88090.0	-14.2***	YR03	79349.4	2.95***
AMS-IAD	-68749.1	-4.22 ***	YR04	98004.6	3.26***
AMS-ATL	-106846	-81.1***	YR05	101800	3.38***
LH	-6927.15	-0.322	YR06	101484	3.28***
UA	-15532.5	-1.28	YR07	104520	3.43***
KL	27209.0	1.07			
NW	6723.44	0.17			
BA	20685.9	1.06			
VS	23775.3	18.1***			
CO	16080.5	1.43			
DL	53997.9	4.79			
CONSTANT	53793.1	3.01***			
OBSERVATIONS	583				
R^2	0,890				

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

Appendix D: Regression estimates on adjusted market shares including year specific effects

Market shares					
adjusted for					
Variables	aggregated levels	<i>t</i> -stat	Variables	Estimate	<i>t</i> -stat
	Estimate				
CS	-0.00405854	-0.815	YR89	0.00496436	0.658
IMM	0.00577847	1,94*	YR90	0.00173817	0.265
PCS	0.000144092	0.0301	YR91	-0.000163077	-0.0358
FRA-NYC	0.0446523	6.44***	YR92	0.000372118	0.115
FRA-CHI	-0.0396814	-10.4***	YR93	-0.000517396	-0.173
FRA-IAD	-0.0313513	-6.56***	YR94	0.000372382	0.238
FRA-ATL	-0.0411742	-2.85***	YR95	-9.49240	-0.00517
FRA-MIA	-0.0320916	-2,48***	YR96	-0.00166172	-0.885
LON-CHI	-0.0588347	-16,5***	YR97	-0.00328060	-3.22***
LON-IAD	-0.0195243	-4.72***	YR98	-0.00329762	-3.54***
LON-ATL	-0.0357854	-1.55***	YR99	0,0000000	
LON-MIA	-0.0371454	-8.99***	YR00	-0.000659478	-0.871
AMS-NYC	-0.0279297	-28.1***	YR01	-0.00272702	-2.44**
AMS-CHI	-0.0495263	-49.7***	YR02	-0.00222131	-1.82*
AMS-IAD	-0.0621567	-16.6***	YR03	-0.00230240	-2.54**
AMS-ATL	-0.0545064	-155***	YR04	-0.00187272	-1.66*
LH	0.00169513	0.494	YR05	-0.00181575	-1.64
UA	0.00448119	1.03	YR06	-0.00181471	-1.30
KL	0.0106342	2.45**	YR07	-0.000837449	-0.821
NW	0.0204624	2.86***			
BA	-0.000247208	-0.0931			
VS	0.00583716	16.6***			
CO	-0.0241899	-6,33***			
DL	0.015429	4.04***			
AA	0.006345	-5.46***			
CONSTANT	0.0544491	11,3***			
OBSERVATIONS	583				
R^2	0,887				

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

Appendix E: Regression estimates on adjusted market shares using London-US as reference

Variables	<u>Market Shares</u> <u>adjusted for</u> <u>Aggregated</u> <u>Levels</u> Estimate	<i>t</i> -stat
CS	-0.00640	-2.61***
IMM	0.000617	1.97**
PCS	0.005340	0.918
FRA-NYC	0.046370	7.97***
FRA-CHI	0.013361	3,34***
FRA-IAD	0.028708	14.0***
FRA-ATL	0.005199	0.894
FRA-MIA	0.000000	
AMS-NYC	0.018908	3.25***
AMS-CHI	-0.00268	-0.462
AMS-IAD	-0.01505	-5.18***
AMS-ATL	-0.00845	-1.45
LH	-0.01814	-4.64***
UA	-0.02923	-9,8***
KL	-0.00971	-3.34***
NW	0.00000	
BA	0.017310	9.59***
AA	-0.02885	-7,16***
VS	-0.00711	-7,83***
CO	0.00000	
DL	-0.00675	-1,16
CONSTANT	0.029431	4,82***
OBSERVATIONS	583	
R^2	0,883	

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level