

# Air transport liberalization and its impacts on airline competition and air passenger traffic

*Tae Hoon Oum<sup>1</sup>, Anming Zhang<sup>2</sup> and Xiaowen Fu<sup>3</sup>*

<sup>1</sup>University of British Columbia, and Embry Riddle University.

E-mail: tae.oum@sauder.ubc.ca

<sup>2</sup>University of British Columbia, Vancouver, BC, Canada, V6T 1Z2.

E-mail: anming.zhang@sauder.ubc.ca

<sup>3</sup>The Hong Kong Polytechnic University, Hong Kong.

E-mail: lgtxfu@polyu.edu.hk

## Abstract

This study examines the impacts of liberalization policies on economic growth, traffic volume and traffic flow patterns, and investigates the mechanisms leading to those changes. Our investigation concludes that 1) liberalization has led to substantial economic and traffic growth. Such positive effects are mainly due to increased competition and efficiency gains in the airline industry, as well as positive externalities to the overall economy; 2) liberalization allows airlines to optimize their networks within and cross continental markets. As a result, traffic flow patterns will change accordingly. Strategic alliance is a second best solution and will have reduced when ownership and citizenship restrictions are relaxed; 3) there is a two-way relationship between the expansion of Low Cost Carriers (LCCs) vs. liberalization. The fast growth of LCCs leads to increased competition and stimulated traffic, calling for the removal of restrictions on capacity, frequency and pricing. In addition, development of LCCs in domestic market can promote liberalization policy by increasing the competitiveness of a national aviation industry. On the other hand, existing regulations hindered the growth of LCCs. Further liberalization is needed for the full realization of associated benefits.

## 1. Introduction and Background

International air transport operates within the framework of the 1944 Chicago Convention on international air transportation, under which airlines' commercial rights on international routes are governed by a complex web of more than 10,000 bilateral air services agreements (ASAs) between each country-pair. These ASAs regulate a wide range of conditions related to the provision of international air services. The WTO Secretariat (WTO 2006) identified seven features of ASAs as relevant indicators of openness for scheduled air passenger services. They are: 1) Grant of rights (air freedoms allowing airlines to provide services over designated markets), 2) Capacity clause (regulation on volume of traffic, frequency of service and/or aircraft types), 3) Tariff approval (whether fares need to be approved before applied), 4) withholding (which defines the conditions for the foreign carrier to operate, such as ownership and effective citizen control requirements), 5) Designation (which governs the number of airlines allowed to serve the market between two countries and on specific routes), 6) Statistics (that requires the exchange of operational statistics between countries or their airlines), and 7) Cooperative arrangements (which regulate the cooperative marketing agreements between airlines). After reviewing 2,299 ASAs in ICAO and WTO databases, Piermartini and Rousova (2008) indicated that the regulations used most frequently are on pricing, capacity and cooperative arrangements. In addition, while 60% of the ASAs allow multiple designations, the remaining 40% permit only single designation.

Since the deregulation of its domestic airline industry, the U.S. government has also pushed for the liberalization of international air markets. In 1979, the U.S. enacted the International Air

Transportation Competition Act, which formally laid down the principle of promoting liberalized bilateral ASAs with foreign countries. A major breakthrough was achieved when the first Open-Sky agreement was reached between the U.S. and the Netherlands in 1992, removing capacity and frequency constraints for aviation services between the two nations. As of 25 November 2008, the U.S. has open skies agreements with 94 countries in six continents, making it the open-skies hub nation of the world (US Department of State website, 2009).

During the period of 1988 to 1997, three air transport liberalization packages were implemented by EU countries, which created eventually a single aviation market for the EU community carriers by adding *Cabotage* rights in 1997. As of 11 January 2007, a total of 66 countries in all continents have recognized EU common market in their ASAs, allowing European air carriers to operate flights between any EU member states and these countries. In April 2007, the EU-US Open Aviation Agreement (OAA) was signed and went into effect on 30 March 2008. While similar agreements are being negotiated with other nations, efforts are made to further liberalize the international aviation market, which would remove remaining constraints such as ownership restriction.

Bilateral air services agreements remain the primary vehicles for liberalization of international air transport services for most countries. During the past decade, about one thousand bilateral air services agreements (including amendments and/or memoranda of understanding) were reportedly concluded. Over 70 percent of these agreements and amendments contained some form of liberalized arrangements, such as expanded traffic rights (covering Third, Fourth and in some cases Fifth Freedom traffic rights), multiple designations with or without route limitations, free determination of capacity, a double disapproval or free pricing regime, and broadened criteria of airline ownership and control. As the airline business evolves, some of the recent bilateral air services agreements have included provisions dealing with computer reservation systems (CRSs), airline codesharing, leasing of aircraft and intermodal transport. One notable development is the considerable increase in the number of bilateral “open skies” air services agreements, which provide for full market access without restrictions on Third, Fourth and Fifth Freedom traffic rights, designation, capacity, frequencies, codesharing and tariffs. As of February 2008, 142 bilateral “open skies” agreements have been reportedly concluded worldwide.

Despite of the fact that many liberalization agreements have been reached over the years, liberalization of the international aviation market remains a formidable challenge. Even with strong political will, the negotiation of liberalizing ASAs remains to be a lengthy process full of disagreements and bargaining. Many of the difficulties in liberalization efforts can be ascribed to stakeholders’ different expectations on the effects of alternative policy / agreement scenarios. The resulting uncertainty of liberalization has prevented many governments from adopting substantial regulatory changes, and has given certain interests groups including national flag carriers strong influence over the negotiation process. Therefore, there is a need to review the actual effects brought by the liberalization process worldwide, and investigate the mechanisms leading to those changes. These efforts would, of course, facilitate policy makers in their efforts to address future liberalization initiatives.

This study aims to achieve the above objectives by investigating the following issues: Section 2 reviews the economic effects of liberalization on the air transport industry and economy. Section 3 studies the airline network competition and restructuring process with deregulation and liberalization, whereas Section 4 examines the impacts of low cost carriers on airline networks and aviation policy. The last section summarizes and concludes the study.

## **2. Economic Effects of Air Transport Liberalization**

The evolving liberalization of international air transport regulation since the mid-1990s has played an important role in the growth of air transport industry by providing a favourable regulatory environment. Worldwide, the total number of annual passengers has grown by 46 percent in the past ten years, from 1.457 billion passengers to 2.128 billion per year (ICAO, 2007). It is estimated (ICAO

Secretariat, 2007) that, in 2006, about 31 percent of the country-pairs with non-stop passenger air services and about 49 percent of the seat capacity were offered between countries that have embraced liberalization either by bilateral “open skies” ASAs or by regional / plurilateral liberalized agreements and arrangements (compared with less than 4 percent and about 20 percent respectively in 1995, and about 16 percent and about 42 percent respectively in 2000). Numerous reports and papers from academia, governments and industries, confirmed that the liberalization efforts had brought significant welfare gains and economic growth world wide.

This section provides an overview of the economic effects of regulation and liberalization. A short summary of the origin and results of regulation is first given. We then review the the economic impacts of air liberalization on the aviation industry. Finally, a discussion on the relationships between air transport liberalization and overall economy is provided. While this paper focuses on the liberalization of international market, the U.S. regulation / deregulation process has also been discussed where appropriate since the regulation / deregulation practice in this market had served much as a prototype in the industry. In addition, the U.S. market has been extensively studied such that rich results and findings have been obtained.

### *2.1. Rationale and the Economic Effects of Air Transport Regulation*

After the World War I, some state-owned enterprises and private airlines began to offer commercial air transport services to the public. However, with low demand and high risk of operation, commercial air transport would not have been sustainable without government support. As a result, the Kelly Air Mail Act of 1925 was passed in the U.S., allowing the Post Office to subsidize private air mail carriage by awarding contracts with payment exceeding air mail revenue on the routes. To oversee such a system, the Civil Aeronautics Board (CAB) was created as a regulator by the Civil Aeronautical Act of 1938. Charged with “the promotion, encouragement and development of civil aeronautics”, the CAB aims to eliminate “unfair or destructive competitive practice” by regulating entry, rate levels and structures, subsidies and merger decisions (Caves 1962, Levine 1965, Borenstein and Rose 2007).

Quite a few studies (Levine 1965, Jordan 1970 and Keeler 1972) found that the regulations imposed by CAB resulted in limited competition and high fares. Levine (1987) pointed out that fares in unregulated intra-state routes tend to have relatively high service level and load factors with remarkably lower fares. High fares maintained by regulation did not, however, lead to high industry profit. Airlines engaged in non-price competition with inefficiently high service quality (e.g., flight frequency, in-flight amenities) and newer, larger aircraft. This reduced airlines’ load factor while increased average costs. In the years just prior to deregulation, the industry average load factors fell below 50% (Borenstein and Rose 2007).

Similar pattern has been observed in the international market. The regulatory system on international air transport was formalized in the 1944 Chicago Convention. The United States, which was effectively the only country with sufficient financial resources, a large aircraft fleet and expertise after the World War II, attempted to promote competition on a multilateral basis. However, such an effort was not successful. Following the precedent of the first US-UK bilateral agreement in 1946 (“Bermuda I”), ASAs generally regulate services (passenger, cargo) and routes to be operated, and stipulate fare-setting mechanisms and capacity limit. In one sense, this bilateral system was an interesting solution to a competition issue: that is, countries at the time feared unilateral application of monopoly power by a trading partner. However, it introduced another set of competition problems by constraining entry, especially to routes between countries (Warren and Findlay, 1998). All these regulations have greatly hindered the growth of international travel. Such a situation only began to change gradually with the passage of the 1979 US International Air Transportation Competition Promotion Act (IATCPA), after which the U.S. began to explicitly promote liberalized bilateral ASAs with foreign countries.

As evidenced by the outcomes in both domestic and international markets, regulations were introduced with good intentions and objectives. Over time, however, policy makers found themselves drifting away from these original targets, with more and more regulations imposed to correct the undesirable effects. Many governments have realized that a better solution is to deregulate / liberalize the market, which have brought very positive economic effects to the air transport industry as well as the overall economy.

## *2.2. Economic Effects of Liberalization on the Air Transport Industry*

While the net effects of previous liberalization events vary across the markets, there are some common changes brought to the air transport industry:

### *2.2.1. Increased Competition, Reduced Price and Traffic Stimulation Effects:*

Most liberalization efforts have brought in significant traffic growth. Such traffic growth was mainly driven by two factors: First, liberalization removes constraints on pricing, route entry, service capacity and cooperative arrangements among alliance members. This allows airlines to compete more effectively and operate more efficiently, which reduces price and increases service quality in terms of flight frequency, frequent flier programs, etc. As a result, passenger traffic can be stimulated substantially. Secondly, liberalization allows airlines to optimize their network configuration. The implementation of hub-and-spoke networks enabled carriers to link small markets with their hub airports, expanding air services to new destinations. Maillebiau and Hansen (1995) developed a translog air travel demand function in a single aviation market in order to forecast the passenger increase between U.S. and five European countries: UK, France, West Germany, Netherlands and Italy. They estimated that the traffic growth from liberalization is 56% with an average benefit of \$585 per passenger. Their results also found a decrease in airline yield of 35% and a 44% increase in accessibility.

This is not a surprising result. Button (1998) found that following the U.S. deregulation, during 1978-1988, passenger traffic increased by 55 percent while scheduled revenue passenger-miles grew by over 60 percent. The real costs of travel fell by about 17 percent on major routes.<sup>1</sup> Morrison and Winston (1986) estimated that the U.S. deregulation yield welfare gains of \$6 billion to passengers and profit gains about \$2.5 billion to stakeholders of carriers (including various labor unions). Table 1 compares the changes in prices of air travel vs. other goods and services in the United States during the 1978-2006 period. It shows that both domestic and international air services are two of the four items with the lowest nominal price increases during the 28-year period: 1.5-1.6 times the price of 1978 for air travel while college tuitions (private and public) increased by the factor of 7.5-8.5 times the 1978 levels.

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<sup>1</sup> Borenstein and Rose (2007) found that between 1976 and 1986, the U.S. average domestic passenger yield declined in real terms at a rate of 3.4% per year, while revenue passenger miles increased at a rate of 8.2% per year. However, they pointed out that the price effects of the U.S. deregulation may have been overestimated. Instead, a major change was an increase in price dispersion. Price dispersion within carrier – routes more than doubled between 1979 and 2001.

**Table 1: Price Changes of Air Travel versus Other Goods and Services**

ITEM-U.S. Good or Service	Unit	1978	1990	2006	Growth
College Tuition: Public	Year	\$688	\$1,908	\$5,836	8.5x
College Tuition: Private	Year	\$2,958	\$9,340	\$22,218	7.5x
Prescription Drugs	Index	61.6	181.7	363.9	5.9x
New Single-Family Home	Home	\$55,700	\$122,900	\$246,500	4.4x
New Vehicle	Vehicle	\$6,470	\$15,900	\$28,450	4.4x
Unleaded Gasoline	Gallon	\$0.67	\$1.16	\$2.59	3.9x
CPI (Urban-All Items)	CPI-U	65.2	130.6	201.6	3.1x
Movie Ticket	Ticket	\$2.34	\$4.22	\$6.55	2.8x
First-Class Postage	Stamp	\$0.15	\$0.25	\$0.39	2.6x
Whole Milk	Index	81.0	124.4	181.6	2.2x
Grade-A Large Eggs	Dozen	\$0.82	\$1.01	\$1.31	1.6x
Air Travel: International	Mile	7.49¢	10.83¢	11.85¢	1.6x
Air Travel: Domestic	Mile	8.49¢	13.43¢	13.00¢	1.5x
Television	Index	101.8	74.6	22.3	0.2x

Sources: General Accountability Office (GAO, 2008), Airline Industry: Potential Mergers and Acquisitions Driven by Financial and Competitive Pressures, GAO-08-845 July 31, 2008.

### 2.2.2. Productive Efficiency Improvement

Liberalization has improved the productive efficiency of the airlines industry via several ways: First, liberalization allows airlines to optimize their network and pricing strategy. This improves airlines' operation efficiency and average load factor. As a result, average costs have been reduced steadily. Secondly, the increased competition following liberalization forces airlines to relentlessly improve their productive efficiency. Less efficient airlines are either merged or bankrupted, while new business models and innovations (e.g., low cost carriers, e-tickets and self service check-in) are nurtured when firms drive to achieve competitive edge. Oum and Yu (1998), Oum, Fu and Yu (2005) found that after deregulation, many remaining U.S. carriers have achieved global leadership in cost competitiveness. Fethi et al. (2000) found that the EU liberalization have improved airlines' efficiency significantly.

### 2.2.3. Effects on Employment in the Aviation Industry

As one would expect, the rapid growth brought by liberalization must lead to additional jobs in the aviation sector. Button (1998) estimated that with the substantial growth following the U.S. deregulation, the employment in the air transport industry increased by 32 percent during the 1978-1988 period. InterVISTAS (2006) estimated that the creation of the Single European Aviation Market in 1993 produced about 1.4 million new jobs in aviation and related industries; the 1998 UK – UAE (United Arab Emirates) liberalization created over 18,700 full-time equivalent positions in the UK side; and the 1986 Germany – UAE liberalization created 745 new full time positions in UAE and 2,600 new jobs in Germany.

It should be noted that the job creation process sometimes is accompanied with job relocation, when firms outsource certain functions to more cost effective regions. For example, with the liberalization / formation of European single aviation market, Lufthansa (LH) began to outsource certain functions to Eastern European countries. In 2005, LH built a new shared customer services center in the Czech Republic, and set up maintenance facilities for heavy checks in Hungary. The airline also plans to move most of its accounting and purchasing operations to Poland. In addition to cost cutting, outsourcing strategies are likely driven by the company's desire to explore overseas opportunities. Outsourcing operations abroad will reduce domestic production. However, a more competitive airline in the global market will achieve more service export for the country (e.g., Clougherty and Zhang, 2008).



### 2.3. Air Transport Liberalization and Overall Economy

There is a two-way relationship between air transportation and the overall economy. It has been well recognized that air transport and logistics, as other transport services, are so called “derived” demands. They are usually purchased as inputs or intermediate products for the consumption / production of some other services: passengers purchase air service because they need to go to the destination for business or leisure, whereas cargos are shipped such that they can be consumed / processed in the destination. Therefore, the demand for transport services is largely driven by the overall economy. Boeing (2008) attributes about two-thirds of traffic growth to the GDP growth, and the rest to other factors such as increasing trade, lower costs and improved services. ICAO estimated the income elasticity for air travel to be 1.27. That is, *ceteris paribus*, a 1-percent increase in GDP will lead to a 1.27-percent increase in air travel.

While air transport is, on one hand, driven by the global economy, it is, on the other hand, an important driver to the global economy. International Air Transport Association<sup>2</sup> (IATA) noted that air transport directly employs four million people worldwide and generates \$400 billion in output. In addition, the efficiency and quality improvements in air passenger services contribute to the growth in sectors such as hotel and tourism. The free flow of people and information, together with improved air cargo operations, promote trade and improve the efficiency of the overall economy. That is, the aviation sector imposes significant positive externalities to other industries, contributing to economic and employment growth. Button et al. (1999) examined the link between high-tech employment in a region and whether the region is served by a hub airport. Using data from 321 U.S. metropolitan areas in 1994, the analysis found that the presence of a hub airport increased high tech employment by an average of 12,000 jobs in a region. Irwin and Kasarda (1991) examined the relationship between the structure of airline networks and employment growth in 104 metropolitan areas in the United States. They found that expansion of the airline network serving a region had a significant positive impact on local employment. The effect was particularly significant in the service sector. Furthermore, analysis using nonrecursive models confirmed that increases in the airline network were a cause rather than a consequence of this employment growth. In addition to job creation, air transport facilitates commerce communication and labor mobility. Button (2006) pointed out that in United States and Europe, more than 40% of air travels are for business purposes. The remaining trips are either for leisure or for visiting friends and relatives. Leisure travel promotes the hotel and tourism sectors, while visiting friends and relative trips provide the basis upon which social ties are retained and, as such, allow for an efficient and integrated labour market.

Air transport is ideal for the coordination of global supply chains, and thereby, improves the overall efficiency of the economy. As firms source around the world for most favorable inputs such as labor, land, technology and capital, manufacturing and factory locations can be sparsely distributed. Hummels (2006) found that the elasticity of air shipping costs with respect to distance declined dramatically, from 0.43 in 1974 to 0.045 in 2004. That is, doubling distance shipped caused a 43% increase in air shipping costs in 1974, but only a 4.5% increase in air shipping costs in 2004. As a result, the average air shipment is getting longer and the average ocean shipment is getting shorter.<sup>3</sup> Recent papers by Aizenman (2004) and Schaur (2006) have argued that air shipping may be an effective way to handle international demand volatility. Because air shipments take hours rather than weeks, firms can wait until the realization of demand shocks before deciding on quantities to be sold. That is, air shipping provides these firms with a real option to smooth demand shocks.

Same as other shipping modes, the efficiency and quality improvements of air transportation promote trade and economic growth. Two major barriers for trade are cost and time related to transportation. Limao and Venables (2001) find that a 10% increase in transport costs reduces trade volume by 20%.

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<sup>2</sup> IATA 2005 annual report.

<sup>3</sup> Hummels (2006) pointed out that ocean shipped cargo traveled an average of 2919 miles in 2004, down from 3543 miles in 1975. In contrast, air shipped cargo traveled an average of 3383 miles in 2004, up from 2600 in 1975.

Recent studies find that a 10% increase in time reduces bilateral trade volumes by between 5% and 8% (Hausman et al., 2005; Djankov et al., 2005). While air transport is clearly superior to other shipping modes in terms of time, its perceived cost disadvantage has been reduced over the years. Swan (2007) found that since 1970, both price and production cost for air travel have been declining at about 1% annually. As shipments are of higher value and lighter weight, the *ad valorem* cost of air freight, i.e., the transport cost needed to move a dollar of goods, is also decreasing. Harrigan (2005) estimated that the relative cost of air transport has declined by 40% between 1990 and 2004. As a result, air cargo is of growing importance in cargo logistics, accounting for about 40% of international trade by value. Many countries have chosen to locate special economic zones and high tech parks near airports.

Some nations, such as the Netherlands and Singapore, achieved rapid economic developments by leveraging on their liberalized transport systems. Compared to its European neighbours such as France and Germany, Netherlands has a relatively small domestic market. Nevertheless, the country have been aggressive in liberalizing its transport sectors: in 1992 it signed the first open-sky agreement in the world with the U.S., promoting Schiphol airport as a major gateway for cross-Atlantic traffic, while facilitating its flag carrier at the time, KLM, to further expand its network coverage in Europe and North America. These efforts, together with its superior transport infrastructures,<sup>4</sup> have made the Netherlands not only a major European aviation hub nation, but also an ideal place to establish European Distribution Centers (Oum and Park, 2004). In terms of value, only 5% of the express cargo and retail logistics handled in the Netherlands are for local consumption (Datamonitor, 2005). With the establishment of their European Distribution Centers, many companies have chosen to also locate their billing centers, service depots, research centers or even European headquarters in the country. The well developed transport and logistics sector in the Netherlands has clearly enhanced the overall competitiveness of its economy.

### 3. Airline Network Competition and Liberalization

In markets not yet liberalized, there can be many constraints on airlines' network configuration. Bilateral air services agreements (ASAs) between two countries limit airports and route access, flight frequency and seat capacity. These regulations prevent carriers from optimizing their overall networks. The limitations imposed with a third country (i.e., limitations on beyond rights such as 5<sup>th</sup> freedom) will further constrain a carrier's network structure in a region. As many theoretical and empirical studies found, when these constraints are removed, airlines often choose to reconfigure their networks to achieve various objectives: to improve cost efficiency by exploiting "economies of traffic density"<sup>5</sup>, to enhance service quality by initiating direct flights and/or by increasing flight frequency<sup>6</sup>, to price more aggressively or to compete more strategically<sup>7</sup>. Many of these objectives are achieved by streamlining a carrier's multi-hub network.

#### 3.1. Effects of Hub-and-spoke Networks and Airline Network Competition

The emergence and prevalence of hub-and-spoke network is one of the most common developments in deregulated markets, especially for airlines endowed with access rights to a single large market such as the United States and European Single Aviation Market. The formation of a hub-and-spoke network can affect both demand and cost.

<sup>4</sup> The Netherlands has the largest marine port in Europe (Rotterdam), superior inland river shipping to Germany and France, and extensive high speed rail and road connections to Western Europe.

<sup>5</sup> See, e.g., Caves et al. (1984) and Brueckner and Spiller (1994). Traffic density is calculated by dividing the total traffic volume by the carrier's network size. Network size is usually defined as the number of origin-destination pairs served by the carrier, or the number of nodes connected in its network.

<sup>6</sup> See, e.g., Morrison and Winston (1987), Berechman and Shy (1998), Brueckner and Zhang (2001), and Brueckner (2004)

<sup>7</sup> Borenstein (1989), Spiller (1989), Berry (1990), Bittlingmayer (1990), Brueckner and Spiller (1991), Brueckner et al. (1992), Zhang and Wei (1993), Oum et al. (1995), Zhang (1996), and Hendricks et al. (1997 and 1999)

The effect of hubbing on costs has been extensively studied in the literature (e.g., Caves et al. 1984, Brueckner and Spiller 1994, Hendricks, et al., 1995, 1999). Costs can go down due to higher traffic densities in hub-and-spoke (HS) operations than in fully connected (FC, or point-to-point) operations, although these cost savings might be offset by the travelers' circuitous routings via hubs.

Hubbing can also affect demand (which, in turn, affects revenues and profits) with its effect on passenger travel time and schedule delay time. Compared to non-stop services, an HS network increases the average passenger's travel time due to the extra connecting time at hubs and the circuitous routing of passenger trips. On the other hand, HS reduces a passenger's schedule delay time – i.e. the time between his desired departure and the actual departure time (Douglas and Miller, 1974) – by offering increased flight frequency. In addition, a HS network allows an airline to serve many additional city-pairs when a new spoke route is added to the network (Oum and Tretheway, 1990).

The hub-and-spoke network is an efficient way to serve destinations over large spatial distance. Airbus (2007) pointed out that, one source of connecting traffic is passengers who could in fact fly directly if they wanted to. For example, in 2006, 20% of those flying between Europe and Asia selected a connecting route, even though they could have taken a direct service. There are several reasons for this. Many passengers prefer connecting services to direct service due to the wider variety of schedules offered at major hubs, either in terms of flight frequency or number of destination cities. Airlines often offer lower prices for connecting services, which is a by-product benefit from global airline alliances (e.g., Oum et al., 2000). Passengers may also choose to fly via a hub to take advantage of a stay-over at an intermediate stop.

Airlines may form hub-and-spoke networks as a strategic response to competitors rather than to simply save costs. Oum et al. (1995) show that hubbing can be used as both an offensive and a defensive strategy in airline network rivalry. Another major benefit of HS networks is associated with a carrier's dominance at its hub airports, which allows it to achieve substantially higher mark-up above costs. Such a benefit to the dominant carrier is referred to as the "hub premium" in the literature, as has been confirmed in numerous studies including Borenstein (1989), Dresner and Windle (1992), Morrison and Winston (1995), Lee and Prado (2005), GAO (1989, 1990), Lijesen et al., (2001), DOT (2001). Such a benefit gives airlines a strong incentive to dominate an airport. Table 2 shows that during the fifteen years after the U.S. Domestic Airline Deregulation in 1978, all major network carriers have strengthened their market shares at their respective hubs.

In conclusion, the prevalence of HS networks after airline deregulation can be explained by cost advantages in production (economies of density) and/or revenue advantages achieved via demand stimulation (network complementarity). Even when there is neither cost nor revenue advantage, the threat of potential entry alone can give rise to an HS network as opposed to an FC network. Zhang (1996) further argues that, for strategic reasons, competing airlines would choose to develop HS networks using different hub airports.



**Table 2: Increased Share of the Dominant Carriers at Concentrated Hub Airports, 1978-1993 Period**

Airport	1978		1993	
	Share	Carrier	Share	Carrier
Atlanta	49.7	Delta	83.5	Delta
Charlotte	74.8	Eastern	94.6	USAir
Cincinnati	35.1	Delta	89.8	Delta
Dayton	35.3	TWA	40.5	USAir
Denver	32.0	United	51.8	United
Detroit	21.7	American	74.8	Northwest
Greensboro	64.5	Eastern	44.9	USAir
Memphis	42.2	Delta	76.3	Northwest
Minneapolis-St. Paul	31.7	Northwest	80.6	Northwest
Nashville	28.5	American	69.8	American
Pittsburgh	46.7	Allegheny	88.9	USAir
Raleigh-Durham	74.2	Eastern	80.4	American
St. Louis	39.4	TWA	60.4	TWA
Salt Lake City	39.6	Western	71.4	Delta
Syracuse	40.5	Allegheny	49.5	USAir

Source: Morrison and Winston (1995)

Upon the deregulation in 1978, major US carriers began to strategically plan their networks to strengthen their dominance in existing hubs and to expand continental market coverage. Such a process was accompanied with massive mergers, acquisitions and liquidations. For example, many airlines based in Central and Eastern United States acquired carriers based in Western United States.<sup>8</sup> This resulted in a massive consolidation of the industry which reduced the number of trunk airlines from over 25 before the 1978 deregulation to 6+ major national network carriers. As a result, all of the national network carriers have built up multiple hub networks in the United States.

While network carriers often utilize multiple hubs, they can not afford to have more than one hub in a region. Airneth (2005) observed that the closest distance between two major hubs in a successful dual-hub system in the United States is 900km, the case of Northwest's Minneapolis-St. Paul and Detroit. In 2008, Delta Airlines acquired Northwest, with a plan to reduce or close the hub functions of Memphis (NW's hub) and Cincinnati (Delta hub), since they are too close to Atlanta and Detroit hubs of the combined carrier. Such a restructuring would result in a network of four hubs in North America: Atlanta, Detroit, Minneapolis-St. Paul, and Salt Lake City. U.S Airways has also reduced drastically the hub functions of Pittsburgh in the last five years since it is close to its own hub in Washington Reagan International Airport.

### 3.2. Airline Network Development and Policy Implication

If domestic and international markets are both fully deregulated, network carriers would be able to expand their multi-hub networks to global markets. Intercontinental mergers and acquisitions are likely to occur since they are usually cheaper and less time-consuming than developing a carrier's own network in other continents (Oum et al., 1993). The current discussions between European Commission and the U.S. on deregulating foreign ownership of airlines would have similar effects as a complete deregulation. In fact, such an agreement aiming to dismantle the limitations on foreign ownership may eventually lead to a complete dismantling of the bilateral ASA system.

Under the gradual liberalization scenario, there will be several driving forces for airlines to restructure their networks. First, full service airlines (FSAs) will consolidate via merger and acquisitions in domestic and intra-continental market, in order to strengthen their network and market positions in a

<sup>8</sup> For example, Delta acquired Western Airlines in order to expand their market coverage in western United States and to secure Salt Lake City as its western hub. American Airlines strengthened its Dallas –Ft Worth hub and acquired Air California. US Air acquired Piedmont and Pacific Southwest. On the other hand, Northwest acquired Republic in order to increase dominance of its Minneapolis-St. Paul hub and surrounding markets.

continent. Second, across different continents the next wave is to strengthen network and market linkages via global strategic alliances (Oum et al., 2000), as evidenced by the formation and growth of major airlines alliances such as STAR, SkyTeam and OneWorld. Since the airlines within each Strategic Alliance Group will retain their own identity, they will structure their networks in such a way to maximize their own profits. As a result, these airlines' international and intercontinental networks will be influenced heavily by the structure of their domestic/continental networks.

Previous alliance studies suggest that international alliances improved partners' operations and service quality, lowered fares and grew the market.<sup>9</sup> However, the future of these global alliances is not crystal clear. Since the existing alliances grew under a web of restrictive bilateral ASAs which barred cabotage and foreign ownership, they represented a "second best" approach to the realization of inter-firm synergies on both the cost and demand sides. (In effect, such realization is constrained by the existing restrictive international regimes; as a consequence, the observed benefits from alliances are lower than their full potential.). Therefore, the future growth of global airline alliances would be limited, if not approaching to zero, under a fully liberalized (both domestically and internationally) air transport market.

When restrictions on route entry, capacity and frequency are dropped in domestic and intra-continental markets, network reconfigurations are likely to be different among United States, Europe and Asia. The US carriers have complete freedom to restructure their domestic networks since 1978. Transborder open skies in Europe began in 1993, and the complete single market (including cabotage rights for all EU carriers) began in 1997. As a result, European airlines had less time to adjust their networks compared to their peers in the U.S. Most cross-border markets in Asia are still heavily regulated. As a result, most of the Asian carriers serve their principal city markets, rather than using their super airports as hubs. Such network pattern can be confirmed as in table 3: Many US airports serve as real hubs, with over 50% connecting ratios. In Europe, only Frankfurt airport has more than 50% connecting ratio. All other airports including London, Amsterdam and Paris have less than 50% connecting ratios. The Asian airports perform even less hub functions. Even the most active hub airport in East Asia, Hong Kong, has only slightly higher than 30% connecting ratio. Many Asian carriers are taking advantage of the restrictive international regulatory regime: with capacity restricted, airlines are able to charge higher prices to local traffic. Therefore, they have less incentive to use the scarce intra-Asia capacity to attract connecting passengers. In 2007, Narita and Incheon have only 17% and 12% connecting ratios respectively. As the international liberalization advances further and perhaps more rapidly in the future, Asian network carriers are likely to restructure their network and traffic routing patterns in such a way to increase hub functions of their major airports.

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<sup>9</sup> For instance, the global alliances have facilitated competition among alliance networks, which significantly improved the efficiency of the international interlining market. Brueckner and Whelen (2000) found that fares are about 18-20 percent lower on international alliance and interlining routes.

**Table 3: Percentage of Connecting Passengers at Major Airports, 2007**

<b>Airport</b>	<b>% Connecting Passenger</b>	<b>Airport</b>	<b>% Connecting Passenger</b>
<b>North America</b>		<b>Europe</b>	
ATL	64.0%	AMS	41.3%
CLT	30.0%*	ARN	22.0%
DEN	43.0%	ATH	21.0%*
DFW	60.0%	CDG	32.0%**
DTW	48.4%	CPH	27.8%
EWR	30.6%	FRA	53.0%
IAD	20.7%*	LHR	36.0%**
IAH	51.2%	PRG	20.3%*
JFK	30.8%	VIE	31.9%
LAS	12.9%**	ZRH	33.8%*
LAX	3.9%		
MDW	25.0%**	<b>Asia</b>	
MEM	63.3%	CAN	20.1%
MIA	39.0%	HKG	33.3%
MSP	47.3%	ICN	12.1%
ORD	68.0%**	NRT	17.2%
PHL	37.0%*	PEK	n.a.
PIT	14.0%	PVG	16.3%
SEA	28.0%	TPE	11.0%
SFO	24.9%		
SLC	50.4%		
STL	23.9%		

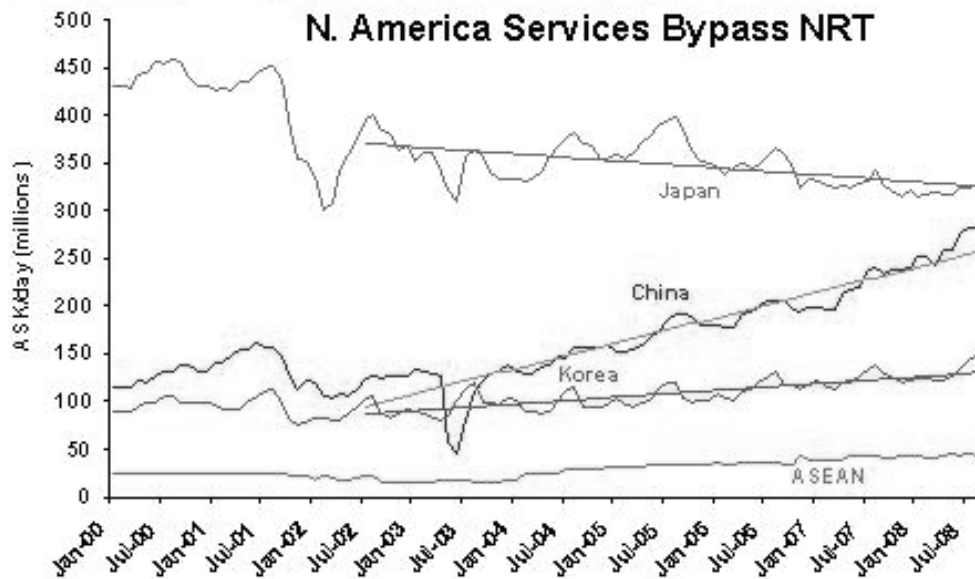
Source: ATRS Airport Benchmarking Report, 2005-2007

\* 2006 data \*\* 2005 data

The varying stages of openness in global aviation market imply that airline networks, and accompanying traffic flows, will experience shift in spatial pattern and market power. For example, Hong Kong had been much more liberalized than the neighboring economies including mainland China, Taiwan, Thailand and Vietnam, etc. Together with its fast growing economy, Hong Kong had secured leaderships for its airport and marine port in the region. However, with the gradual liberalization of mainland China, Hong Kong airport's hub status is facing serious challenge from nearby airports such as Guangzhou and Shenzhen. Since South Korean air carriers lost most of their domestic markets to high speed rail (KTX), the country has no choice but to adopt Singapore style policy to promote open skies regimes internationally, especially with China, Japan and Southeast Asian countries. It is noteworthy that South Korea has open skies ASA with the United States since 1998.

Due to historical reasons, Japan gave major bases of operations at Narita and other major Japanese airports to United, Northwest and Federal Express, and opened its markets to other US carriers substantially. However, Japanese government now realizes that the importance of economic integration with China and South Korea, and thus, the open skies regime in Northeast Asia is a more urgent task than signing open skies with the United States or Canada. Since both Tokyo-Narita and Tokyo-Haneda airports are expected to have substantially more slots in 2010, Japan expects to allocate a lion's share of these increases to Asian carriers, especially carriers of Northeast Asian subcontinent. An issue that worries Japanese government a lot is that there has been an increasing trend that Northeast Asia - North America air traffic are bypassing Tokyo-Narita (NRT) as shown in Figure 1.

**Figure 1: North American – East Asian Traffic Diversion**



Source: Swan (2007)

Even for countries with deregulated air transport markets, it is important to maintain their leadership in liberalization, thus that to keep their aviation sector competitive in the global market. Singapore, for example, has been working hard to maintain its leadership in the region in terms of air transport liberalization. As of 2006, Singapore has signed over 90 ASAs with other countries, compared to the 57 ASAs signed by Hong Kong.<sup>10</sup> Singapore also reached open-skies agreements with the U.S., New Zealand and the United Arab Emirates. In June 2006, the country became the first Asian nation to sign an open-skies agreement with the EU, which allows Singapore Airlines to fly anywhere within the 27 EU-nation bloc. Such aggressive and determined liberalization policy had helped the nation to maintain the competitiveness of its airports and airlines.

#### 4. The Impacts of Low Cost Carriers and Implications on Aviation Policy

A strong trend that emerged with deregulation and liberalization in the United States, Canada and Europe was the disappearance of weaker airlines through bankruptcies or mergers but at the same time the birth of upstart competitors. Well-established brands like PanAm, Eastern Airlines, TWA and Canadian Airlines International disappeared, while LCCs such as Southwest and several new brands (e.g., JetBlue, Westjet, Ryanair, EasyJet) emerged and prospered. As pointed out by Transportation Research Board (1999), "Probably the most significant development in the U.S. airline industry during the past decade has been the continued expansion of Southwest Airlines and the resurgence of low-fare entry generally."<sup>11</sup> The "Southwest effect" – i.e., a rapid increase in traffic volume and a simultaneous fall in fares on routes where, or close to where, Southwest Airlines operates – has become widely known (US DOT, 1993; Richards, 1996). The price effects of LCCs were empirically estimated by, among others, US DOT (1993), Windle and Dresner (1995), Dresner et al. (1996), and Morrison (2001).<sup>12</sup> Franke (2004) suggested that Europe has a similar "Ryanair effect," whereas Zhang, et al. (2009) suggested that the "Southwest effect" might also exist in Asia.

LCCs such as Southwest Airlines and Ryanair grew under a deregulatory domestic environment – after the EU integration in the mid-1990s, the EU internal market has become a "domestic" market.

<sup>10</sup> It should be noted that the number of ASAs signed is not the sole indicator of market openness, since some ASAs signed may not be active. In addition, compared to other Asian economies Hong Kong has much better access to mainland China, a large and fast growing market.

<sup>11</sup> This statement was also quoted at the beginning of Morrison (2001).

<sup>12</sup> See Tretheway and Kincaid (2005) for a literature review on the effect of LCCs on air fares in the US.

In Asia, entry of LCCs was facilitated by domestic deregulations as well. While deregulation and liberalization have facilitated the growth of LCCs, the LCC experience has also promoted policy reform and liberalization. Until 1978, the US airline industry was regulated by the Civil Aeronautics Board. It was mainly through the experience of unregulated Southwest Airlines – which offered lower fares for intra-state (Texas) services than comparable regulated services between states – that the deregulation of market entry commenced in 1978 with the passage of the “Airline Deregulation Act” (Levine, 1987; Morrison, 2001). This has in turn stimulated Southwest’s domestic expansion as the state borders did not matter any more.

Another case in which LCC experience stimulates policy liberalization is the ASEAN (the Association of Southeast Asian Nations) region where significant progress has been made lately. In July 2007, ASEAN countries reached an agreement under which unlimited flights between capital cities in ASEAN will start at the end of 2008. Furthermore, it was expected that ASEAN nations will sign an “open skies” agreement as early as December 2008 (Asia Times, 2008). These positive policy developments are due mainly to the positive effects of liberalization, both domestically and regionally, and of emerging LCCs. Consider the case of Malaysia. After maintaining a strict closed-skies aviation policy for many decades, more recently Malaysia has seen a boom in air traffic growth due to greater domestic competition led by AirAsia. This, together with the success of other regional LCCs, has prompted the Malaysian and other ASEAN governments to push for a more liberalized regulatory regime (Asia Times, 2008). Another major motivation for liberalization in these Southeast Asian countries is to boost tourism and business travel after the devastating Asian financial crisis of the late 1990s.<sup>13</sup> As a case of regional liberalization, consider the lucrative Singapore-Kuala Lumpur route. This route had for years been restricted by Malaysia to protect Malaysian Airlines, and was dominated by Malaysian Airlines and Singapore Airlines as a duopoly. In late 2007, the Malaysian government decided to allow AirAsia to operate on the route, paving the way for Tiger Airways (from the Singaporean side) to enter the route as well. The liberalization policy started with allowing two flights daily from each LCC, and then was extended to six daily flights in September 2008. As illustrated in Zhang, et al. (2009), the entry by AirAsia and Tiger Airways forced the two incumbent FSAs to significantly lower their fares, to the clear benefit of passengers.

Dobruszkes (2009) investigated airline competition in Europe following the liberalization in 1997. He found that traditional European airlines, especially the majors (Air France, British Airways, Lufthansa and KLM) have not benefited directly from the liberalization of European airspace in order to operate flights not centered on their country of origin. Their contribution to the usage of the 5<sup>th</sup> -9<sup>th</sup> air freedoms in Europe is less than 1% each. These carriers make greater use of the 5<sup>th</sup> -9<sup>th</sup> freedoms outside Europe, in particular on long –haul flights to the Far East that involve a stop over. In Europe, these carriers remain strongly rooted in their national centers. It is LCCs that have benefited most from the new air freedoms available as shown in table 4. Dobruszkes (2009) suggests that this may be due to the new mode of operation by LCCs, which facilitates the development of extra-national bases.

**Table 4: Contribution of LCCs to the Use of 5th-9th Freedoms**  
(Europe 2005, excluding SAS from the total)

Air Freedoms	Flights	Seats
5th	0%	0%
6th	0%	0%
7th	63%	77%
8th	0%	0%
9th	24%	47%
Total	53%	71%

Source: Dobruszkes (2009)

<sup>13</sup> It is also interesting to note that statistics from the Tourism Office of Macau Government shows that after Viva Macau, a LCC, flew to Indonesia, Australia and Japan, visitor arrivals by air from these three countries have grown by 71%, 290%, and 300%, respectively.



Another important channel via which LCCs promote further policy liberalization is through the enhancement of the competitiveness of national carriers. Clougherty and Zhang (2008) identify three paths via which domestic rivalry (domestic competition) might influence international performance on the part of airlines. First, when there is an equivalence between the number of domestic and international competitors (that is, every domestic airline also serves international markets) then increasing the number of domestic competitors also increases the number of international competitors representing the nation. Accordingly, a strategic effect results as having multiple national competitors in world markets will enhance exports. Second, a “joint-economies of production” effect derives from the impact of domestic rivalry on the size of an incumbent firm’s domestic operation, since size of domestic operation affects international performance in the airline industry (Clougherty, 2002, 2006). Third, domestic rivalry may also pressure firms to improve product quality and/or productivity, thus enhancing the competitiveness of home-nation airlines in international markets. In short, an additional rationale behind domestic deregulation and competition could well be the promotion of domestic carriers’ competitiveness in international markets. Accordingly, the dramatic growth in domestic competition due to LCCs may significantly impact international competitive outcomes.

The large economic benefits of LCCs are so visible that their further developments tend to speed up the deregulation / liberalization process of domestic and international airline markets. On the other hand, as discussed in Zhang, et al. (2009), there are still a large number of visible and invisible barriers acting against growth of LCC activities in markets where LCCs are most needed. The organizational structure of AirAsia, arguably the most successful LCC in Asia, shown in figure 2, serves as a telling evidence of restrictions for an Asian LCC to grow its services cross national boundaries. In particular, given the restricted aviation regime in the region, AirAsia could extend its network and enter a new regional market only through joint venture (JV) arrangements or alliances: Thai AirAsia in Thailand and Indonesia AirAsia in Indonesia are two JV examples in which AirAsia holds a 49 percent share, so as to abide the national ownership restrictions of Thailand and Indonesia respectively.

**Figure 2: Operating Companies for Air Asia Group**



More recently, Tiger Airways (of Singapore) tried to establish JVs, namely, Tiger Airways Australia and Incheon Tiger Airways, in an attempt to expand its services to Australia and South Korea, respectively. While the Australian JV is in operation, the Korean project was called off in late December 2008 after more than one-year planning, citing by the “regulatory uncertainty” in Korea and a weak global economy (The Straits Times, 2008). The project would have been a tie-up with Incheon Metropolitan City, with the Singapore company taking a 49 percent stake. But from day one, the project faced local opposition. In August 2008, Korean LCCs (namely, Air Busan, Yeongnam Air, Jeju Air and Jin Air) jittery about the impending competition, filed a complaint with their country’s

Ministry of Land, Transport and Maritime Affairs. They urged the government to put the brakes on the launch of the new carrier, claiming that it would in effect be controlled and run by Tiger, since the other shareholders had no airline experience. The airlines went so far as to say that the new airline would “attack Korea’s aviation sovereignty” (The Straits Times, 2008).

The experiences from North America and Europe suggest that the benefits brought by LCCs are concrete, dramatic and lasting, and that they form a significant part of the gains from air transport liberalization. However, to fully gain such benefits, liberalization and deregulation need to be carried out.

## **5. Summary and Conclusion**

As early as in the 1944 Chicago Convention, there had been proposals to liberalize the international aviation market. It took the industry half a century before the first Open Skies agreement got approved by the US-Netherlands governments in 1992. Although many Open Skies agreements have been reached in the following years, liberalization remains a formidable challenge. In addition, many of these liberalizations have been partial and incomplete, which needs further deregulations on ownership control and beyond rights etc. Many difficulties in liberalization can be ascribed to stakeholders’ different expectations on the effects of alternative policy / agreement scenarios. The resulting uncertainty has prevented many governments from adopting substantial regulatory changes. This study examines the effects of past liberalization policies on economic growth, passenger traffic and low cost carriers. Our main conclusions are as follows:

- Liberalization has led to substantial economic and traffic growth. Such positive effects are mainly due to 1) increased competition in the aviation market, which reduces price and stimulates traffic growth; 2) productive efficiency gains as a result of carriers’ optimization of their network operations and pricing strategy. In addition, the increased competitive pressure forces airlines to improve productivity, and eliminates inefficient carriers out of the market; 3) positive externalities to the overall economy including employment opportunities, trade promotion, better transport and logistics services etc. These impacts are not uniform across countries. However, there has been an increasing number of countries adopted (progressive) liberalizations. This suggests that countries involved have benefited from liberalization in general.
- Liberalization allowed carriers to optimize their networks to cover intra / inter continental markets. Hub-and-spoke networks have been extensively used by airlines to achieve cost advantages in production (economies of density) and / or revenue advantage. If ownership / citizenship restrictions are relaxed, market consolidation via merger and acquisition would allow airlines to strengthen their networks and market position. Strategic alliances allowed airlines to achieve “second best” network connection in markets where BSAs are still restrictive. Upon liberalization, the future growth of global airline alliance would be limited. Liberalization and network competition in international markets imply shift in traffic spatial pattern and market power. Therefore, it is important for countries to maintain their leadership in liberalization, thus that to keep their aviation sector competitive in the global markets.
- The prosperity of low cost carriers has brought significant impacts to the airline industry. There is a two-way relationship between LCC expansion vs. liberalization (and deregulation). The fast growth of LCCs leads to increased competition and reduced fare, which stimulate traffic substantially. These changes call for the removal of restrictions on capacity, frequency and pricing. In liberalized markets such as the EU single aviation market, LCCs have benefited most from the liberalization of beyond rights by establishing airport bases across borders. In addition, development of LCCs in domestic market can promote liberalization policy by increasing the competitiveness of a nation’s aviation industry. On the other hand, existing regulations on route entry, ownership and effective citizen control have constrained the expansion of LCCs, and thereby, prevented the associated benefits to be fully realized.

The possibility of creating “destructive” or “excessive” competition had often been used as an excuse for regulation. Our investigation revealed that such negative effects were not material. Protection and regulation did not lead the airline industry to efficiency and profitability as hoped by policy makers. Instead, countries leading deregulation and liberalization scored various benefits for their aviation industry as well as the overall economy. Therefore, it is important for first-mover countries to maintain their leadership in liberalization, and it is urgent for countries still practicing tight regulation to catch up the wave of liberalization.

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