Literature review of the airport business

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Abstract

Airports are very important for economic growth. The demand for airport capacity has been growing very fast and private companies are now also investing in airport infrastructure. Airports must however be regulated because they are natural monopolies with high market power.
Airports have variables and factors that are vital for airline operations. The identification of these variables are important to allocate airports for airline operations, minimize airline operation costs and fares, and maximize airline profits.
This paper presents a literature review about different type of airports as a first step to identify the main parameters required for developing a new airline business model. This model should eventually be able to determine, from a set of existing airports, the location of the airports as well as the most profitable routes for low-cost airline companies.

Keywords

Airport hubs, secondary airports, regional airports, carrier, airline-airport relationship

1 Introduction

Airports are highly complex units that provide service for passengers, airlines and all other airport users. They must deal with tens of thousands of passengers and employees, and a mass of specialized services that depend on timely and accurate processes. Airports are a long-term growth industry that transported around 1.7 billion passengers all over the world in 2000, with annual revenue of 1 trillion United States (US) dollars, and is expecting to transport around 1500 million US passengers in 2025 (Neufville and Odoni, 2003).

Airports represent a very important industry in today's economy for every country in the world. Efficient, secure and customer-focused airports are important to achieve economic growth because they can increase the accessibility for passengers and maximize the economic advantages from global air connections (Smyth, 2007).

The deregulation and liberalization of the airline industry has increased the competition between airports (Pestana and Dieke, 2007) sharing or competing in the same catchment area. The deregulation and liberalization of the air transport in Europe happened at a lower pace than it occurred in the US during 1970s (Schnell, 2003). It took place in three different periods: 1987, 1990, and 1992 (Burghouwt and De Wit, 2005). International Air Transport Association (IATA) considers that airports' effective economic regulations are essential because airports are natural monopolies. With high market power and without regulations, the commercial focus of airports is misaligned with the needs of airlines and passengers (Smyth, 2007).

The grow of the full-service carriers (FSCs), along with the evolution of low-cost carriers (LCCs), have increased the demand for airport capacity infrastructure. This has been due to the strengthening in air traffic, affected by the fuel price. Demand has changed mainly because of the different airline business models and new aircraft technologies, i.e. A380 and B787 (Forsyth, 2007). New airports have been built, main airports have been expanded, new low-cost facilities have been constructed in some airports to serve LCCs, and secondary or regional airports are increasing revenues providing service to LCCs.

LCC passengers normally use less convenient airports if the money they are saving is higher than the cost to reach the airport (Aldamari and Fagan, 2005). LCCs have performed strategies to fly from less convenient secondary airports, taking advantage of their cheaper costs (Forsyth, 2007). Main goals are to minimize costs, achieve fast turnaround times, reduce airport charges, and increase the service level. All of these are key airline operative variables (Smyth, 2007).

Nowadays, private companies are investing in airport infrastructure. Some airports have been bought by private firms, though most are owned by national governments, local and/or state/regional governments (Neufville and Odoni, 2003).

This paper presents a literature review about different types of airports and their main features. Airports have variables and factors that are vital for airlines operations. The identification of these variables is important to allocate airports for airline operations, minimize airlines operation costs and fares, and maximize profits. Chapter 2 explains the airport aeronautical and non-aeronautical revenues. Chapter 3 talks about different

airport variables, hub airports, secondary airports, and regional airports. Chapter 4 gives a brief explanation about the airport-airline relationship. Chapter 5 explains three airport capacity problems: Slot allocation, Security, and Turn-around times. Chapter 6 talks about airport and new aircraft technologies. Chapter 7 presents the final conclusion.

2 Airport aeronautical and non-aeronautical revenues

Airport revenues are classified into aeronautical and non-aeronautical. Aeronautical revenues include only revenues generated via service and facilities related to aircraft operations, passengers and cargo. Non-aeronautical revenues are the ones produced by commercial services and facilities at the airports (Neufville and Odoni, 2003).

Nowadays, new airline business models, wars (Iraq and Afghanistan), and illnesses (SARS) have increased the airlines and airport operation costs (Gillen and Ashish, 2004). These issues have forced airports to plan new strategies in order to minimize operation costs and maximize aeronautical and non-aeronautical revenues. Thus, airports have become more commercial, and along with the optimization of the labor force (baggage handlers, dispatchers, customer service, security points, and others), the non-aeronautical revenues have become a much more important source of profits.

The most common aeronautical charge is called landing fee. It's the fee that aircrafts pay to use the airfield (runway and taxiways) calculated in reference to the maximum take-off or landing aircraft weight, depending on the airport. Terminal area air navigation fee is the airline's cost for the use of runaway and taxi lights, airport radar, instrument landings system, and traffic control. Aircraft parking and hangar fees allow them the use of contact and remote apron stands, and sometimes hangar space and it is calculated as a proportion of either the weight or dimension of the aircraft. Airport noise fees directly depend on the time of the day, peaking at night. Passenger fees or terminal service fees cover costs for the use of passenger buildings. Cargo service fees cover the cost of cargo processing facilities and the service executed by the airport, and it is calculated as a fee per ton of freight. Security fees cover costs of security. Ground handling fees are divided into ramp handling fees and traffic handling fees, or passenger handling and cargo handling. En route air navigation fee covers the cost of civil aviation authorities or similar bodies (Neufville and Odoni, 2003). Table 2 shows a classification of airport aeronautical and non-aeronautical revenues.

Non-aeronautical fees are often known as commercial revenues. Concession fees for fuel and oil are charged for the fuel sold to the airlines at the airport. Concession fees for commercial activities include small enterprises inside the facility such as duty-free shops, retail shops, bars, restaurants, banks, currency exchange, etc. Revenues from car parking and car rentals are charged for these facilities at the airport. Rental of airport land, space in buildings, and assorted equipment mainly derive from space rented to airlines for offices and passenger "club" lounges, equipment rented to shippers, freight forwarders, advertising in space, etc. Other fees are charged for airport tours, admissions, etc, and some of them are derived from provisions of engineering services and reimbursable utilities by the airport operator to airport users. Finally, non-airport revenues refer to the consulting, educational and training service to other airports (Neufville and Odoni, 2003).

Table 2: Airport aeronautical and non-aeronautical revenues (Neufville and Odoni, 2003)

Aeronautical Revenues	*Non-aeronautical Revenues*
Landing fee	Concession fees for aviation fuel and oil
Terminal area air navigation fee	Concession fees for commercial activities
Airport noise charge	Revenues from car parking and car rentals
Passenger charge or terminal service fee	Rental of airport land, space in buildings, and assorted equipment
Cargo service charge	Fees charged for airport tours, admissions, etc
Security charge	Fees derived from provisions of engineering services and reimbursable utilities by the airport operator to airport users
Ground handling charge	
En route air navigation fee	Non-airport revenues

Major airports get high amounts of revenue from both types of airline and passenger fees. Secondary and regional airports depend on what advantages they offer to airlines for using them as a destination. Variables such as geographic localization, tourism, population, catchment area, accessibility, and available capacity determine the advantages or disadvantages in the contracts signed with the airlines. In the case of secondary and regional airports, aeronautical revenues are generated mainly from business with LCCs. LCCs represent more than 64% of their total revenues. As the LCCs increase traffic and number of passengers, airport revenues increase from commercial revenues (concession, bar, restaurants, car-parking facilities, etc.). Service for more airlines and passengers are the opportunity for busy, secondary, and small airports to raise profits and stimulate their growth such as Ryanair at Stansted, Prestwick, easyJet at Liverpool, and Luton and Bmibaby at East Midlands. This relationship between airlines and secondary/regional airports has developed new airport strategies to serve more airlines and bring more passengers, i.e. Frankfurt Hahn has abolished landing weight aircraft fees for all Boeing 737 to encourage LCCs traffic. Others have reduced landing or handling fees (aeronautical revenue), placing more focus on non-aeronautical revenues instead of the aeronautical ones (Graham et al, 2004).

LCCs are the best contributor for secondary and regional airports. That is the reason why the small airports in Britain are trying to increase LCCs traffic and, thus, increase their aeronautical revenue. In the case of non-aeronautical revenues, LCCs passengers contribute significantly to small and large airport groups. Charter passengers are insignificant at large airports, but they are largely significant in terms of revenue at small airports in Great Britain. FSC passengers carry around more money and are willing to spend it, and they contribute significantly to the non-aeronautical airport revenues (Papatheodorou and Lei, 2006).

The incentive for an airport to serve more airlines lies in the opportunity of increased passenger volume at the airport. It will increase non-aeronautical revenues, while the incremented costs of handling more passengers are low due to economic density (Guillen and Morrison, 2003).

3 Airport types

The Federal Aviation Administration define airport as any area of land or water used for landing or takeoff of aircrafts, including seaplane, heliports, and facilities to accommodate any aircraft (http://www.faa.gov).

Operative indicators are fundamental to determine the success of an airport. Different variables are involved in airport operations: accessibility, check-in and check-out times, nearby parking, baggage systems, air traffic, landing fees, passenger fees, airport capacity, passenger congestion, future growth, security and concession space expansion, runway length capacity and opening times, catchments area, number of airlines served, network (number of cities served) frequency flights, and environmental regulations (noise and gases). Airports need to be able to achieve high efficiency in these variables to be attractive to different airline operations and increase passenger market in terms of good services, functionality, value for money, cost-effectiveness, technical and economical efficiency, and profitability.

An airline has to choose an airport taking into account the number of daily flights to the hub, the number of airports served by the hub (as different products offered), and the number of gates at the hub (hub capacity), among other variables. Airlines compete for the gates of the airports (airport capacity) since changing the number of gates at a hub is slow and implies high costs (Butler and Huston, 1999). Also, depending on the internal market size (small or large), airlines use three different route system strategies: point-to-point, hub-and-spoke, and multi-hub. This has a direct implication in the type of airport they are operating and also in the type of aircraft they are flying in each route. Thus, to serve small market, LCCs and FSCs use a point-to-point routing system strategy. In large markets, FSCs choose a hub-and-spoke routing system, while LCCs opt for the point-to-point routing system. As a result, FSCs work in their hubs and LCCs are pushed out to smaller cities with small traffic (Alderighi, 2005).

Hub-and-spoke systems allow “spoke” cities to gain better service and lower prices, while hub cities gain better service at the cost of somewhat higher fares (Butler and Huston 1999). Big LCCs are in reality becoming network carriers, because as they grow bigger, their operations slowly transform into a hub-and-spoke system.

Normally, hubs are located in cities with large population, high income levels, central location and business activities. Every big airline operates at least one major airport hub (Butler and Huston, 1999). In order to determine origin and destination (O&D), airports are located in spots where they maximize their attraction to airlines; therefore, variables which are attractive to travelers, such as specific geographical location, large economy, population, and tourism places are largely taken into account. Airports that want to attract LCCs carriers need to be able to handle increased air traffic, known as the Southwest effect in the US and Ryanair effect in the EU (Guillen and Ashish, 2004).

3.1 Airport hubs

Hubs are commonly used by major airlines because they connect passengers at a common point, giving airlines the capacity to increase the number of destinations at

less cost than if they tried to connect all destinations in a point-to-point route system (Butler and Huston, 1999). Hubs must have a number of specific characteristics, as listed in Table 3. They represent an advantage for FSC because of high frequency service, and they provide several attributes as listed in Table 4. Business passengers would continue to buy full fare tickets (Dennis, 2007). Airlines would increase their number of city-pair coverage and the number of the connecting links would be n(n-1)/2 where n are the number of spokes (Doganis, 2002). Thus, hubs are an important component for the FSC airlines (Guillen and Morrison, 2003). However, hubbing has some disadvantages in short-haul operations, due to increased direct operation costs, produced by more than one landing fee and airport charges. In the long-haul, operations would result in less direct service, longer journey times, and higher fares if the routes were controlled by one hub airline in the absence of competition (Doganis, 2002).

Airlines consolidate traffic into airport hubs. It increases the competition between airlines demanding more capacity and, thus, increasing airport costs. Airport Hubs are monopolies that can transfer costs to the airlines just by increasing their aeronautical fees, and just a few airlines are financially strong enough to resist the raises. This makes it necessary to regulate aeronautical fees: it is the only way to protect new airlines trying to compete and operate in the major hubs. Major airlines will make alliances (Star Alliance/SkyTeam) to concentrate traffic at hubs with central geographic location, large and affluent catchments area, and a resident carrier such as KLM and Air France at Schiphol and Charles De Gaulle Airports (Stelter, 2004). When airlines control the majority of the air traffic at hubs, the monopoly power can produce higher fares and reduce services. These hubs are called “fortress hubs”. A large hub gives a carrier the advantage of more market share of the passenger and increases the competition in market connection (Butler and Huston, 1999). Figure 1 shows the top 10 biggest airports in the World.

Table 3: Airport hub characteristics (Doganis, 2002)

Central Geographical Position in relation to the served markets
Ample runaway capacity
A single terminal building for the hub airline
Strong local demand from the hub
Strong hub-based airline

Table 4: Connection Attributes (Mashford and Marksjo, 2001)

Departure, Arrival and Transit times
Cost of connection
Number of stops
Waiting times at each stop
Types and number of aircraft changes at each stop
Number of Carriers at the hub

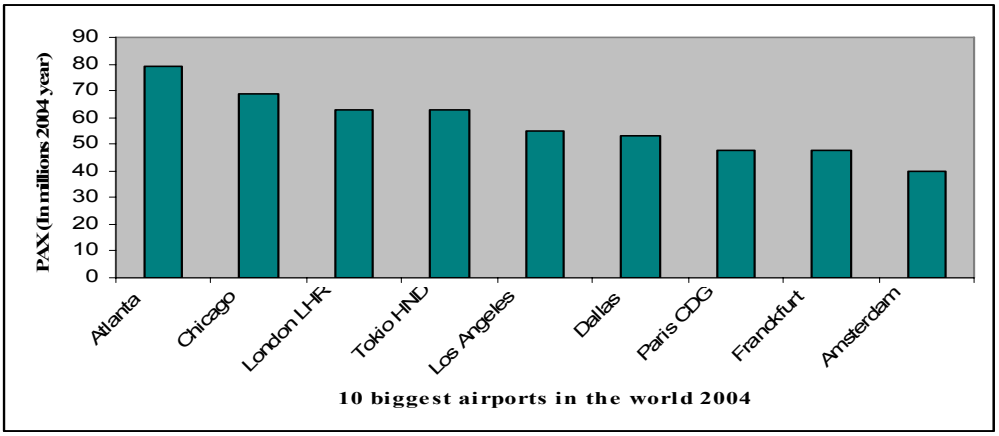

Figure 1: 10 biggest airports in the World, Million of Passenger (Stelter, 2004)

Legacy hubs carriers need to industrialize their processes and reduce complexity. In the case of the long-haul carriers, they cannot avoid providing hot meals and, therefore, cannot avoid the costly processes associated with providing this service (Guillen and Ashish, 2004). One of the most successful strategies for the network carriers in the short-haul involves concentrating on their hubs because it allows reducing costs by increasing crew and aircraft productivity and outsourcing services. LCCs subsidiaries are successful in markets away from the main hub cities (Dennis, 2007).

Travelers in non-hub markets benefit from more competition but hubs offer service to more destinations. It is impossible to regulate hub market prices without charging larger costs to travelers. Hub airlines have understood that high prices should be reserved for routes without competition, whilst for routes with competition low fares are needed. Thus, routes with high prices are main targets for LCC airline operations (Butler and Huston, 1999).

3.2 Secondary airports

The success of secondary airports may be due to the inefficiency of major airports. They have cost advantages even without subsidies. They can offer LCCs better conditions for aircraft operations such as fast turn-around times and lower aeronautical fees because they can be more efficient than major airports since they are less congested. However, some secondary airports can be controlled by a dominant single low-cost carrier and then subjected to more risk and low bargaining power. Basically, Airlines can leave the airport if the airport does not represent a good business (Guillen and Ashish, 2004).

The majority of the secondary airports are being operated in a point-to-point routing system, because it is a cost-efficient and profitable system for airlines and passengers. This increases the demand for secondary and regional airports and reduces traffic from airport hubs (Stelter, 2004). Southwest operates not congested airports of small cities or less congested of large cities to increase aircraft utilization, minimize taxi time, fewer gate holds and gate costs, and low landing fees (Guillen and Ashish, 2004). Some LCCs have been subsidies by local governments to fly to local airports and increase the air transport services and tourism activities. Even when an airport is reporting negative profits and it is being subsided by the local economy; tourism

consumption and other tourism services overcome losses at the airport level (Papatheodorou and Lei, 2006).

3.3 Regional airports

This type of airport is attractive for origin and destination locations, particularly, traveled by LCCs in a point-to-point route system.

Many small airports survive thanks to airport fees and handling activities. Commercial activities do not have a big impact because they do not have the required infrastructure and developing it would require new terminal investment (Graham et al, 2003). Some regional airports need investments to build accessibility between airport and cities, such as buses and train stations, to increase their business market area (Guillen and Ashish, 2004).

Regional airports play a minor role in the FSC business model as the majority of related services act as feeders to major hubs (Papatheodorou and Lei, 2006). FSCs need alliances with small carriers to increase network and serve more cities flying mainly from a major or secondary to a regional airport in an O&D point-to-point route system.

4 Relationship between airports and airlines

The most recent airline strategies in the US suggest that some changes may happen all around the world (Schenell, 2003). Recent changes in the structure of the airline and airport industries may force airlines and airports to change their strategies and sign beneficial contracts for both (Forsyth, 2007). Many startup deals between LCCs and airports include the reduction of landing fees and handling charges from airports. Airports usually charge twise as much to the LCCs compared to the FSCs, if airlines operate service from larger and more expensive airports. In other cases, LCCs relationship between airports and airlines have forced secondary or regional airports to pay airlines to operate, i.e. the agreement between Ryanair and Charleroi Airport now investigated by European Commission for illegal state subsidy (Graham et al, 2003).

The LCC business model has grown rapidly in the last decade and this growth has been coincident with the reform of the airport business. Airports have changed from a public utility to one of the modern business and this has contributed to the success of low-cost carriers' growth. However, this new situation has created some tension, since airports that previously serviced only FSCs are now serving LCCs with their simpler network and emphasis on connectivity. Having airports specialized in servicing one type of carrier rather than other could in some cases relieve the demand for airport capacity and represent an advantage for the airline companies. Indeed, it was a usual outcome of the strategic positioning of LCCs to use secondary and reliever airports as a hub because it can represent in some cases a good business strategy (Barret, 2004).

Airlines are the main customers for airports because airlines pay airports for landing fees, handling passengers, or freight. Airlines primary customers are passengers. Nowadays, airports are paying more attention in getting non-aeronautical revenues from retail and concessions. Thus, airports are seeing passengers as important

customers and looking towards attracting airlines operations to grow the number of passengers or customers. As it is easy to notice, the relationship between airline-airport-passenger has changed, since passengers represent generation in non-aeronautical revenues, but airlines are still responsible for bringing passenger to the airports that they operate (Graham et al, 2003).

Major airports are offering price schedules to LCCs carriers less expensive than for the major airlines, considering some or all of the airport and non-airport related costs listed in Table 5. Some are building new LCC terminals, designed to appeal to the LCCs but not the legacy carriers (Forsyth, 2007). Now, some LCCs like easyJet serve Amsterdam and Gatwick (Francis, 2003). The effect of the entry of an LCC will only be the reallocation of passengers among carriers at an airport with little impact on the allocation of the passengers among airports. There is more variation in price among carriers at an airport than among airports (Blackstone et al, 2006).

The effect of low fares on consumer behaviour and the unwillingness of flyers to travel to distant airports to obtain lower fares increase the ability of carriers to exploit monopoly, power, and discriminate in prices. Consumer behaviour is important for airlines and airports business. Passengers decide not just for an airport, they also make a choice on the airline they like (Blackstone et al, 2006). The attractiveness of airports for an airline service depends on consumer behaviour variables such as distance to the airport, frequency of flights, fares, accessibility time, available seats, catchments area, income, international flights, parking facilities, share of passenger, and share of available gates.

Table 5: Airline Costs from Airport-related and non-airport related costs (Stelter, 2004)

Airport-related costs	Aero-nautical charges
	Station and ground handling
	Total airport-related-charges
Non-airport related costs	Ticketing and sales
	Crew
	Aircraft costs
	Passenger Service
	Fuel and Oil
	Administration
	En route charges
	Maintenance
	Total non-airport related costs
Total Cost	Total airport-related + non-airport related costs

5 Slot allocation, security, and turn-around time at airports

A major problem for European LCCs is the difficulty for new airlines to obtain slots at busy airports even if they want to pay for them. Legacy airlines have most of the slots at busy airports, because they have preferential access to the airports in demand,

such as British Airways and Lufthansa at Heathrow and Frankfurt airport (Forsyth, 2007). Then, LCCs use main airports when they have spare capacity.

Two different ways of allocating this capacity are being performed:

1. In US, the procedures designed to allocate slots is handled, first-come, first-served basis, for aircraft queuing for landing and taking-off from a congested airport. This leads to big delay times.

2. In contrast, in the EU, the aircraft allocation is by slot system. Slot systems allocate aircrafts achieving an effective use of busy airports with few delay caused by the congestion provoked by the demand growth. The slot systems are limited to the number of flights that are permitted in an airport at busy times.

Passenger security (passport control, customs, and quarantine) and the growth of demand involve additional labor, equipment, and more terminal space capacity at airports. Terminal expansion is cheaper, faster, and has less regulation problems than runway expansion where environmental regulations and neighbors residency has to be considered. Additional capacity can be warranted by the construction of new airports in less constrained sites, or expanding secondary airports, i.e. Stansted airport in England (Forsyth, 2007).

Table 6: Average time in minutes for turns at Albany airport New York 15th of June 2001 (Gillen and Ashish, 2004)

Airline	*Taxi-in*	*Gate*	*Taxi-out*	*Turn around*
American	4.0	79.5	26.0	109.5
American Eagle	4.0	32.7	10.3	47.0
Delta	5.3	87.7	13.7	106.7
Northwest	4.7	38.3	14.0	57.0
Southwest	2.7	35.4	7.9	46.0
United	3.5	80.5	10.5	94.5
US Air	3.4	47.7	15.9	67.0

The turn time involves the taxi-in time, time spent at the gate, and taxi-out time. An example can be found in Table 6, in which the Albany Airport's average time in minutes for turns for a specific day is analyzed. The aircraft size or number of passengers has a big influence in the taxi-in time because a bigger airplane will require more time for passengers to get into the aircraft, which means aircrafts spend more time on the ground but at the same time they serve more passengers. Taxi-out times increase with airport traffic. Flight scheduling helps faster turns and Southwest usually schedules flights when airports are less congested. The point-to-point service used by the LCCs fall in more take-offs and landings because of the short-haul travel time. Thus, aircrafts are more time on the ground instead of being in the sky, making important the reduction of turn around times to minimize the time spent on the ground and increasing the aircraft utilization (Guillen and Ashish, 2004). Airlines operating hub airports find it difficult to maximize aircraft utilization due to the number of airlines operating in a hub. They spend more time on the ground than the minimum

time period, which means longer turn-around to cater, clean and other airline operations at the airports (Dennis, 2007).

6 Airport and new aircraft technologies

New aircraft technologies such as Airbus 380 and Boeing 787 might allow airlines to tackle issues such as the constant growth of the fuel prices, environmental concerns (noise and gas), and minimize seat kilometer cost in medium-haul and long-haul operations. The innovation of new aircrafts will create new markets and fares. At the same time, the competition between Boeing and Airbus will develop new aircrafts technologies. For example, Airbus is producing the new A350-XWB to compete the B787 market.

The introduction of new aircrafts requires new airport investments and operations costs depending on the airport, i.e. runway and building gates at terminals (Forsyth, 2007). The A380 has a high capital cost, because its operations will require more staff (on-board, check-in and ramp handling), higher ground handling costs, weight-based landing fees, bridge access and more operation times (turn-around and taxiway) (Bieger, et al 2007).

The selection of the aircrafts for an airline represents an important strategy. Market size and growth rate are the main variables to be considered when a carrier is choosing the aircrafts they need for their routes and frequencies. If the aircraft is too big (i.e. A380) the break-even load factor could not be reached and losses would occur or frequencies would be reduced trying to reach the load break-even load factor. On the other size, if the aircraft is too small, frequencies will rise and with it direct operation costs and airport charges. Thus, the capacity of a small aircraft must get the same revenue than the break-even revenue point of larger aircraft without generating over capacity; otherwise, there is no reason to change. Other variables affecting this decision may be temporal, seasonal and directional demand and aircraft configuration capacity (King, 2007).

The new aircrafts could increase the pressure of busy airports, and airlines could drop fares to fill the new big aircrafts (A380). This would make hub operations more attractive and the demand for busy airports could increase again (Forsyth, 2007). On the other side, new Boeing 787 could increase the possibility to increase the area of point-to-point LCC travel distances because it is very cost efficient and can fly long-haul routes.

7 Conclusion

The aim of this paper was to look for the main airport variables that have a big impact in airlines operations.

Airports revenues are divided into aeronautical and non-aeronautical. Aeronautical revenues are the fess charge to the airlines for their aircraft operations. Non-aeronautical revenues are related to the potential airport commercial activities. Geographic localization, population economic level, tourism, catchment area, accessibility, and available capacity determine advantage or disadvantages of an

airport. Airports with low advantages must develop strategies to increase non-aeronautical revenues to offer less aeronautical revenues and be more attractive to airlines.

Hub airports have the highest advantages, so they have the possibility to charge high amount of aeronautical and non-aeronautical revenues. This type of airport must be under regulations because they are natural monopolies with high market power that can charge high aeronautical fees, and affect passengers and airlines.

Commonly secondary airports depends on their ability to explode their non-aeronautical revenues because they need to offer less non-aeronautical fees to be more attractive to airlines and serve more passenger volume.

Secondary airports allow LCCs to have fast turn-around times, availability gates and cheap aeronautical fees. They can offer LCCs lower fees because they are more efficient than major airports since they are less congested. Secondary airports can be controlled by a dominant single low-cost carrier and then subjected to more risk and low bargaining power.

Regional airports survive thanks to aeronautical fees as they do not really have infrastructure to get high non-aeronautical revenues. Regional airports are feeders for FSCs that normally make an alliance with regional airlines to increase their network. These airports are also attractive for LCCs operations because they also can offer good conditions for LCCs operations such as fast turn-around times, and low aeronautical fees.

Airports have variables and factors that are vital for airlines operations. The identification of these variables is important to allocate airports for airline operations, minimize airline operation costs and fares, and maximize airlines profits.

Aeronautical fees are important variables that airlines need to consider before choosing an airport as a destination. These types of fees affect airline operation costs and airlines business strategy. Aircraft weight, aircraft size, and the time of the day are the variables that determine the amount of aeronautical fees to an aircraft.

Operative indicators are fundamental to determine the success of an airport. Different variables are involved in airport operations: accessibility, check-in and check-out times, nearby parking, baggage systems, air traffic, landing fees, passenger fees, airport capacity, passenger congestion, future growth, security and concession space expansion, runway length capacity and opening times, catchments area, number of airlines served, network (number of cities served) frequency flights, and environmental regulations (noise and gases). Airports need to be able to achieve high efficiency in these variables to be attractive to different airline operations and increase passenger market in terms of good services, functionality, value for money, cost-effectiveness, technical and economical efficiency, and profitability.

The attractiveness of the airport will increase with the addition of new flight connections, high frequencies and capacity.

Airport capacity, turn around-times and security are some of the major problems that airports need to solve. Airport capacity depends on the availability for an airport to offer slots. Turn around-times depends on the aircraft size and number of passengers. Turn around-times reduce airport capacity if aircrafts can not be ready in a short time. Passenger security (passport control, customs, and quarantine) and the growth of demand involve additional labor, equipment, and more terminal space capacity at airports.

The introduction of new aircrafts requires new airport investments and operations costs. The new aircrafts could increase the pressure of busy airports, and airlines will have to drop fares to fill the new big aircrafts (A380). This could make hub operations more attractive and the demand for busy airports will increase again. On the other side, new Boeing 787 could achieve the possibility to connect secondary and regional airports in a long-haul point-to-point routing system.

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