Infrastructure: Airports

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UCLA Anderson Forecast Report[i]
September 2002

Air Transportation and Airports

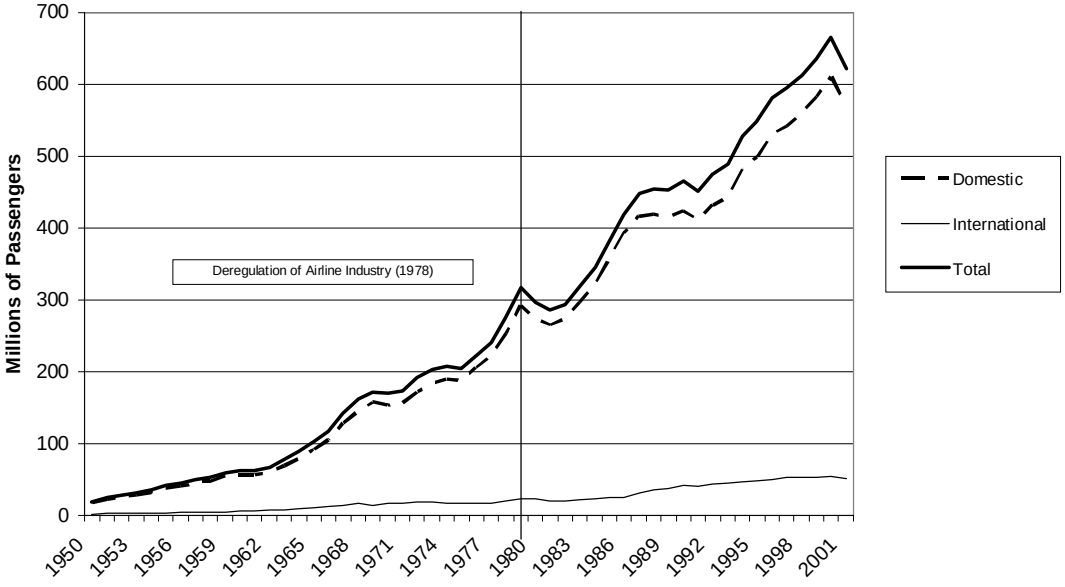
Transportation is a critical part of any business, whether it is due to the need to receive supplies in or ship final products out. Yet it may be that the most important form of transportation does not involve the movement of physical goods, but the movement of human capital. It is personal linkages that cements important deals and creates the trust that remains the lynchpin of any long-term business relationship even in our increasingly litigious society. The airlines are an effective system for moving people long distances, thus airports are an important part of a competitive business environment. This is especially true in a Southern California where there are extensive ties to the rest of the United States and also with Asia and Latin America.

The recent failure of the El Toro Airport proposal has created considerable doubt about the future of this critical element of Southern California's infrastructure. Are we about to have an airport crunch? Will congestion at LAX restrict the ease with which business people move in and out of our economy? This essay examines this issue. To sum up, the largest problem we have with the current airport infrastructure is not total capacity. LAX could handle well over 5 times the number of passengers it currently does without even adding new gates or using larger airplanes. The problem is one of capacity at times of peak demand, both during the day and across the days and months. In the past California has always dealt with any capacity issues, be it total or peak load, by expanding at the extensive margin—building new airports or physically expanding the current ones. Unfortunately a lack of available land, a tight state budget, and an already congested freeway system makes this opportunity less viable as we move into the future.

California can grow with its current stock of airports. But we need to concentrate on improving the existing system on the intensive margin—by using what we currently have more efficiently. This implies using peak-load pricing schemes that will serve to push demand at the peak times to off-peak times, and move traffic from congested runways such as those at LAX to other less congested airports such as Long Beach or Ontario. The cost savings for infrastructure

Figure 1

ENPLANED PASSENGERS BY U.S. SCHEDULED AIRLINES (1950 - 2001)



Source: Air Transport Association

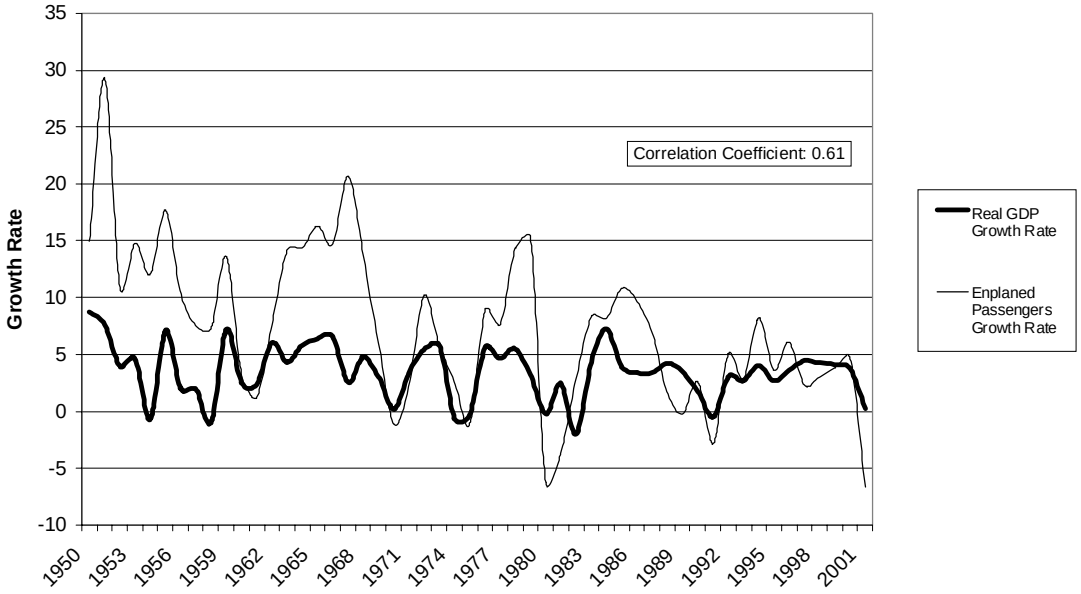
investments will be enormous. There will be a price to pay, however, and that will be one of convenience. A higher price for flights at desirable times implies that many of us will need to find less desirable times to travel. It could also mean longer waits at hubs before we can transfer to the routes that will take us on to our final destinations.

When we consider how common air travel is now and how important it is to maintaining global businesses, it is easy to forget that it wasn't too long ago that the industry was not as widely used. The airline industry has experienced a vast expansion over the past half century. Since 1978, the volume of travel has nearly doubled, going from 300 to 600 million passengers. During the same period of time the total population grew by only 28%. The FAA has predicted that by 2010 the enplaned passenger totals may reach 1 billion, although this currently seems unlikely given recent trends. Major airlines expanded their service over the past three decades since deregulation primarily through the development of hub-and-spoke networks. With the hub-and-spoke system an airline can serve the maximum number of cities with a minimum number of airplanes by using central clearinghouses for all passengers. The resulting efficiency has been dramatically lowered prices.

An important, but not surprising, feature of the number of enplaned passengers is its sensitivity to business cycles. Figure 2 shows growth rates for real GDP and airline traffic. We see that in each recession in the last fifty years the growth rate of passengers decreases sharply, and when economic expansion starts again the flow of passengers grows more than proportionally. In 2001 the combination of slow economic growth and the events of September 11 had a particularly harmful impact on the airline industry, decreasing overall passengers demand and increasing the security costs of travel. The timing of the El Toro

Figure 2

REAL GDP AND PASSENGERS GROWTH RATE
(1950 - 2001)



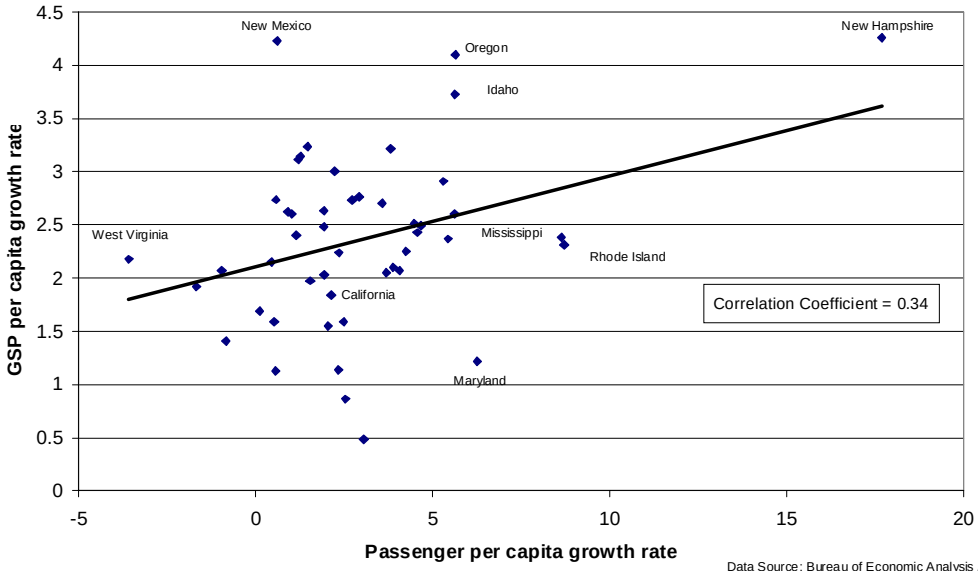
Source: Air Transport Association (ATA). Federal Reserve Board of St. Louis.

airport discussion could not have happened at a more unfortunate (or fortunate if you were opposed to the idea) time, in that much of the discussion went on in a time when low demand implied less strain on the current system. It should also be noted that the pace of airline expansion has slowed over time. After growing much faster than real GDP for many years, traffic growth slowed to just slightly over GDP growth in the 90's. This is likely because the true cost of airline traffic for many today is not the airfare but the time costs involved. Until airlines find a way to substantially reduce time costs at airports and in the air, or at least help us make our airtime more productive, it seems unlikely that we will see the kind of surge in growth the FAA is predicting anytime soon. So while the congestion we felt in the late nineties will be back when growth returns, it isn't clear that the congestion will become that much worse anytime soon.

How important is air transport for growth? It is difficult to make an exact estimate. Figure 3 is a scatter diagram with the gross state product per capita growth and the enplaned passengers per capita growth for the 1990's. The fastest growing states experienced, on average, the largest increase in air travel. The direction of causation is not very clear though. Air transportation certainly contributes to economic growth in different ways: helping to expand the local tourism industry and reducing the cost of doing business. Yet it may also be that with income growth consumers substitute air travel for other slower means of transportation. In either case, if California expects to be a fast growth state the demands on the current system can be expected to grow at a rapid pace.

Figure 3

Passengers per capita growth and GSP per capita growth (1990 - 2000)

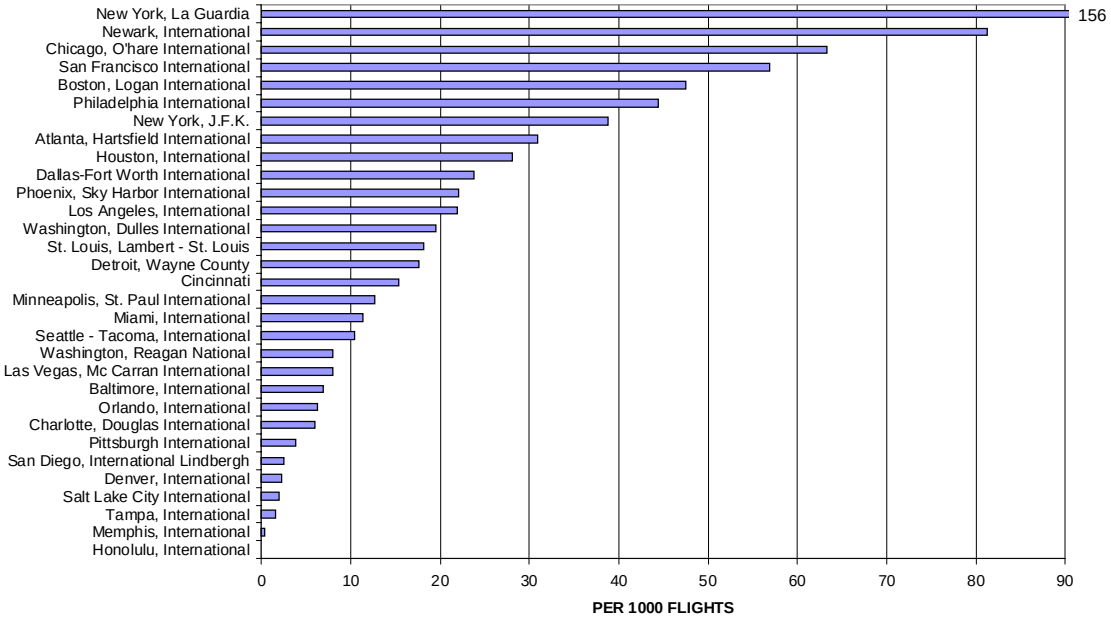


Data Source: Bureau of Economic Analysis / FAA

Figure 4

DELAY RATE FOR 31 BUSIEST AIRPORTS (2001)

(Delays of 15+ minutes per 1000 operations)



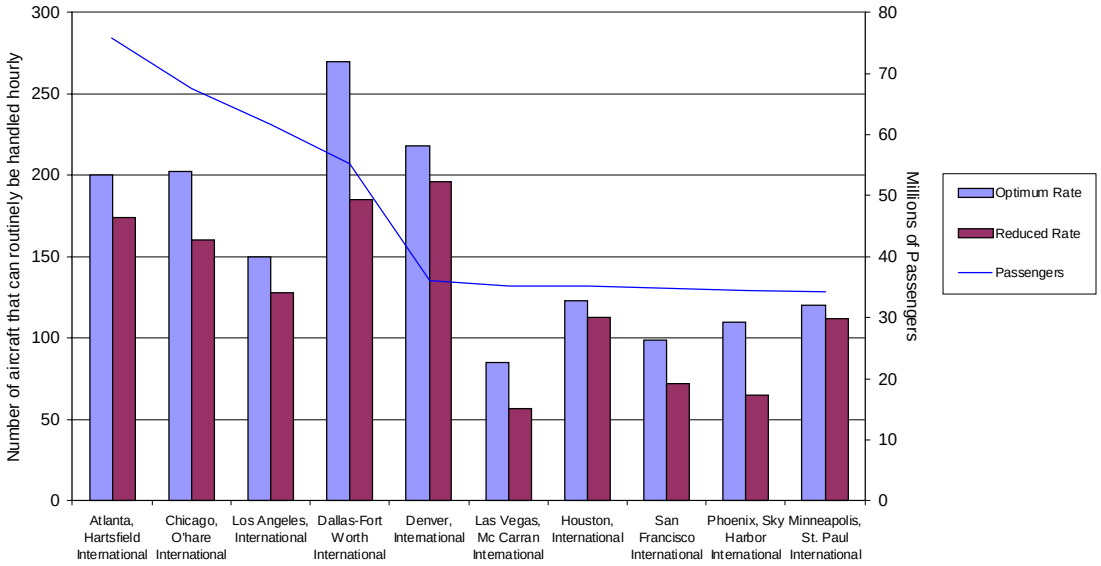
Source: Aviation Capacity Enhacement Plan. Federal Aviation Administration 2001

Indeed rapid growth in the volume of passengers has started to catch up with capacity in many places in the US, stressing the system and causing an increasing number of delays. Figure 4 depicts is the time delay for the thirty-one of the busiest airports in terms of enplaned passengers between October 2000 and April 2001. The delay rate measures the number of flights that had more than 15 minutes of delay per 1000 operations. We must be cautious with this data since most of the delays are caused by weather conditions. According to the Federal Aviation Administration 69 percent of the delays can be explained by climatic factors, and only 14 per cent to volume factors (excess of airplanes)[1]. However, if we compare airports in the same geographical area, we can identify which one has excess of delay due to traffic congestion. The clearest cases are the New York, La Guardia Airport and Newark International Airport that have delays rate of 156 and 81 flights, respectively. Nevertheless, New York's J.F.K. airport—located in the same area—has only a delay rate of 39 flights. This gives some evidence that these airports are operating at different levels of capacity utilization. It is also true that weather has a more dramatic impact on the efficiency of operations when capacity is already tight and there is less slack in the system that can be used to make up for lost time. California has also suffered from the congestion issue. The two busiest airports in the State, SFO and LAX, are ranked in the top 12 in terms of delay.

So how much capacity lead congestion is there? Airport capacity measures and passengers enplaned in the top 10 busiest airports are shown in Figure 5. The airport capacity is calculated as the maximum number of flight arrivals and departures that an airport can routinely handle in an hour. The airport capacity is estimated in periods of unlimited ceiling

Figure 5

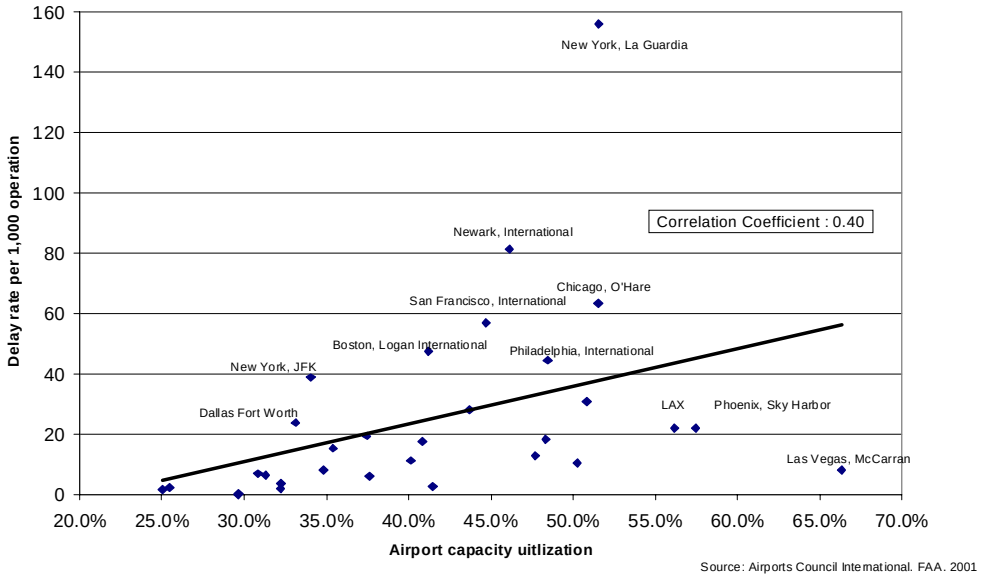
AIRPORT CAPACITY AND PASSENGERS ENPLANED FOR THE TOP 10 BUSIEST AIRPORTS (2001)



Source: Aviation Capacity Enhacement Plan. Federal Aviation Administration (2001)
Airport Council International (2001)

Figure 6

AIRPORT CAPACITY UTILIZATION AND DELAY RATE (2001)



Source: Airports Council International. FAA. 2001

and visibility (optimum rate) and during reduced visibility conditions when radar is required to provide separation between aircraft (reduced rate). In the chart we can notice that some airports can be severely constrained as a consequence of climatic conditions. In general airports with low capacity loss have a relative advantage, since they don't require excess capacity in order to avoid congestion during bad weather conditions.

Figure 6 shows the relation between airport capacity utilization and time delay. Airport capacity utilization is the percentage of time that an airport requires to work at maximum capacity to attend all arrivals and departures.[2] As is expected, on average greater airport utilization (congestion) is related with more delays. Given that LAX is the third busiest airport in the nation behind Chicago and Atlanta, but has a smaller capacity than either of these facilities makes the fact that LAX ranks 12th on the list of delays positive news. It is surprising that for the same level of congestion the delay rate varies considerably between airports. These differences can be explained basically by two factors. The first one, as mentioned before, is weather conditions. The second one is the distribution of the air traffic *during the day*. If most of the air traffic is concentrated around the peak times, this will exceed the airport capacity resulting in significant delays. This fact is important. LAX currently has a low level capacity of 130 planes per hour. If we assume that each plan can carry 250 people in or out of the area then this implies an annual passenger capacity of 280 million passengers, well over 5 times the current load! Of course this would only occur if planes landed at the airport at a constant rate around the clock. This doesn't happen of course. Instead there are certain hours of the day and certain days of the week where travel is more desirable.

Figure 7 is the time distribution of arrivals for La Guardia, JFK and Los Angeles airports[3]. Each graph shows the number of arrivals at 15 minutes

interval between 7 am and 10 pm and two capacity benchmarks at optimum rate. The first capacity benchmark (facility estimated) is provided by airport operators. The second one (model estimated) is obtained from the FAA airfield capacity computer model. There are considerable differences in the congestion distribution of the airports. In the case of La Guardia airport, the number of arrivals exceeds capacity during most of the day. For JFK and Los Angeles International airports the peak periods are observed only temporarily during the day. A similar graph might be made of days during the week, and various times of the year. From these graphs it seems that in the case of La Guardia, there is a true shortage in the availability of airport infrastructure, while in the other two cases the problem is primarily related to the concentration of traffic at peak hours.

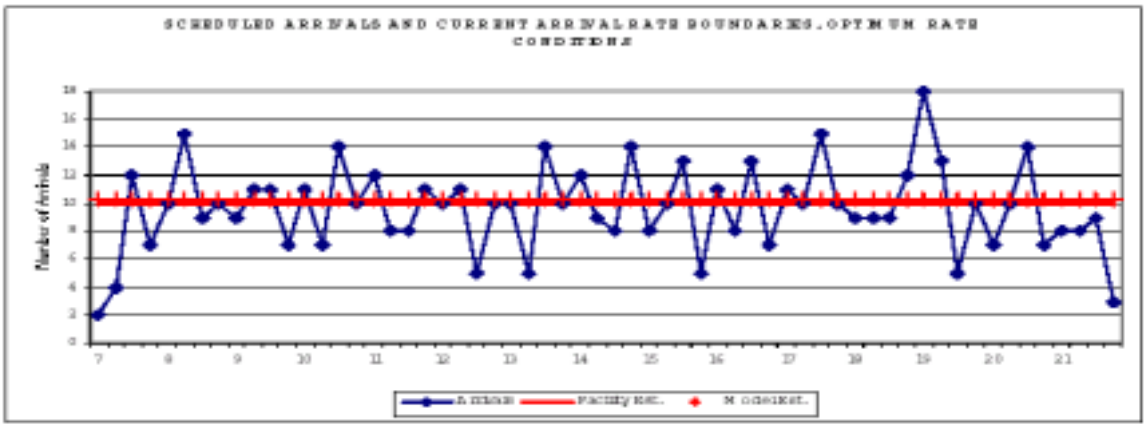
There are basically two alternatives to deal with congestion at airports. We can expand airport infrastructure in the extensive margin or the intensive margin. The extensive margin involves an increase in the physical infrastructure of airports through investment in runways or terminals. For airports that are congested at all times, like La Guardia, this is the only real solution besides restricting traffic. For airports such as LAX that are only constrained at peak periods this effort primarily increases usage of airports at the peak hours. Much of this investment ends up functionally wasted, as off-peak times remain under-utilized. In other words this is a high price-low return type investment when capacity issues only occur at times of peak demand. Further there are secondary effects such as crowding on local roads and highways that must be dealt with as peak traffic expands. The intensive margin implies the efficient use of actual infrastructure without additional investment, in other words using the existing infrastructure more efficiently. In the case of airports this implies primarily expanding non-peak traffic.

An intensive margin expansion is related to the price regulation of airport infrastructure. The congestion in airports is similar to what happens when there is a price cap in a market; the demand and supply are not equalized. Currently airline fares are not fully reflecting the scarcity of airport infrastructure at peak times, so at peak hours the delay rate increases substantially introducing congestion costs to all passenger and freight transportation. Introducing an efficient pricing mechanism can spread the demand to less congested hours. For example, landings fees priced according to peak hours or lower fees for larger aircrafts with more passengers can provide incentives to more efficiently use existing infrastructure stock.

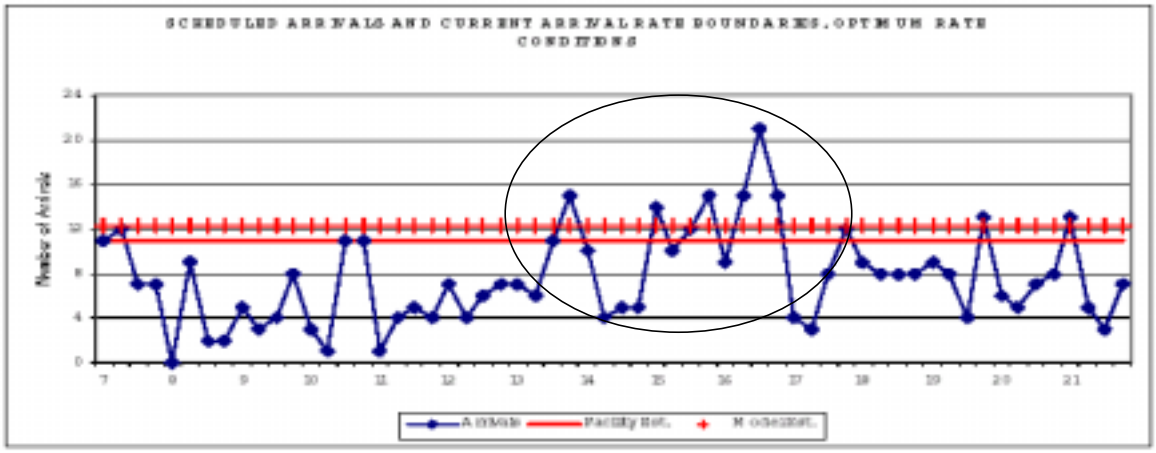
Airport infrastructure growth in the extensive margin is difficult to implement, not only for the significant cost it represents but also of the opposition of residents near the airports. For example, the estimated cost for El Toro Airport was in 1997 around $1.4 billion dollars, but this was a rough target.[4] In the case of Denver airport, the construction cost exceeded $3.6 billion the initial budget, which resulted in an increase in landing fees to recover the additional expenditure.[5],[6] Also in the case of El Toro Airport, 54 percent of the Orange County residents were opposed to its construction in the year 2000[7].

One approach to expand airports in the extensive or intensive margin without using public funds is to transfer the ownership to the private sector. The first privatization was made in 1987 in England, when Margaret Thatcher sold to private owners seven British Airports. In this group was the Heathrow Airport, which is now the fourth busiest airport in the world. In the United States, the Federal Aviation Administration is conducting an Airport Privatization Demonstration Program that permits up to five airports to shift from public to private ownership or control. Stewart International Airport, located

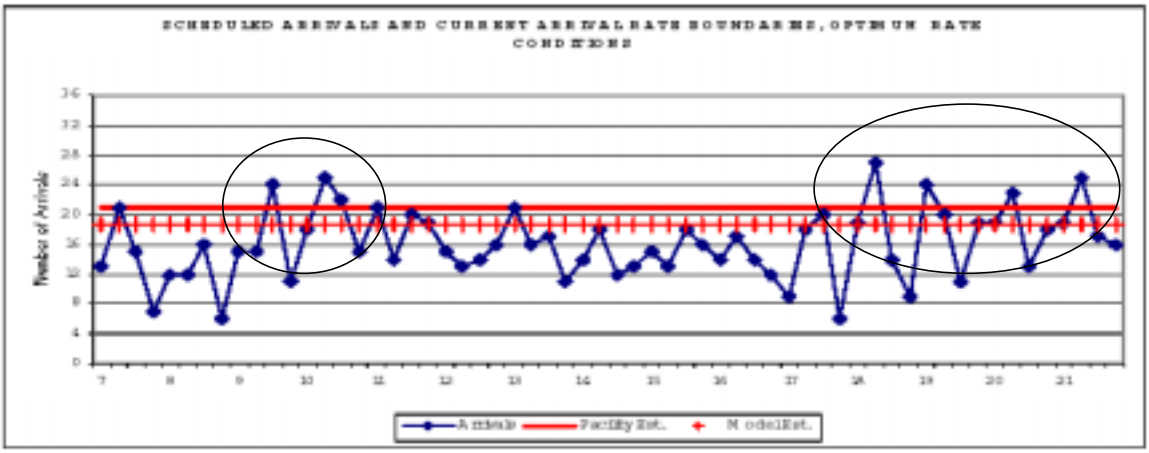
Figure 7
New York, La Guardia Airport



New York, JFK Airport



Los Angeles International Airport



in New York was the first airport to participate in this program. In the year 2000 New York State Department of Transportation selected National Express Group, from England to manage the airport under a 99-year lease agreement.

Other experience in airport privatization in the United States was the concession for 25 years of Terminal 4 at JFK international Airport, which started operating in 2001. The consortium composed of LCOR, Schiphol USA and Lehman Brothers invested $1.4 billion to develop the project. At present, terminal 4 has 1.5 million square feet, 16 gates and serves 37 airlines. In the United States privatization of airports can be a sensible strategy to follow in order to improve airports services and handle air traffic congestion. The FAA privatization demonstration program can give some experience in order to promote private investment in large hubs airports.

In the next years, the challenge for the United States and California is to expand efficiently airport capacity. The FAA[8] predicts that for 2010 LAX will be an airport with significant passengers delay[9]. Its airport capacity will increase 11 percent at optimum rate and 4 percent at the reduced rate as a result of technology improvements, whereas the total operations are expected to growth 25 per cent. As we have seen in figure 7, there is the possibility for an intensive margin expansion in LAX airport (for example increasing fees at peak hours, like in the morning and afternoon). A peak-load pricing scheme can be an alternative to manage air traffic in the future without incurring in considerable costs. If the price of airport infrastructure reflects better its relative scarcity, airlines and passengers will use it efficiently.

Endnotes

[1] *Aviation Capacity Enhancement Plan*. FAA 2001.

[2] This is assuming that the airport can work at maximum capacity 24 hours a day, 365 days of the year.

[3] The graphs were obtained from the *Airport Capacity Benchmark Report*. FAA (2001)

[4] Los Angeles Times Editorial, Metro Section, Thursday, October 30, 1997

[5] Los Angeles Times: *Whatever Happens, Private Airport Is Matter of Public Trust*. Sunday, March 22, 1998. By Christopher Cox. The total cost of Denver Airport was $4.8 billions.

[6] Is not surprising then that Denver has a relatively high capacity relative to the number of passengers (figure 6).

[7] Orange County Annual Survey made by the University of California at Irvine. 2000.

[8] Airport Capacity Benchmark report. 2001.

[9] The other airports that expect to have significant delays are La Guardia, Newark, JFK, Chicago O'Hare, San Francisco International and Philadelphia International.