Improving benchmarking of seasonal airports

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ABSTRACT

There are certain businesses which are productive and working close to capacity year round and others that have a majority of their operations only in a certain fraction of that year. This has a big effect on their productivity and financial viability. How can airports with different traffic structures during the year be benchmarked in a meaningful way? And how do these seasonal airports survive, if they are only maximizing their productivity for 3, 4 or 5 months in a year?

This paper aims to answer some of these questions. Firstly, we present the effects that seasonality will have on benchmarking. Groups of seasonal and non seasonal airports will therefore be analyzed. A detailed examination of their utility capitalization and their winter and summer peaks should help in understanding the background of operation at these types of airports. We will also introduce the Gini coefficient and try to see how it can be used in downsizing the effects of seasonality when it comes to benchmarking. Lastly we will introduce some ideas that can management can use to overcome the problems that seasonal airports have in comparison with other normal non seasonal ones.

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1.0 Introduction

Airport capacity varies from airport to airport. The extent to which that capacity is utilized also varies. On the one hand we have some airports that are large in size but on a yearly basis maybe only use thirty or forty percent of their capacity due to their traffic structures, on the other hand we observe large airports that already operate under full capacity. From here the question arises, how airports with such a huge difference in productivity can be used for benchmarking. Malighetti et. al. (2008) discusses that the season effects are one of the important obstacles of efficiency of airports.

There are airports that are located on certain geographical regions which have a popular demand in certain times of the year. The main reason is that these geographical regions are tourist hot spots in certain months of the year and offer maybe exquisite beaches or ski resorts. Some of these airports are very crowded and have close to maximum capacity utilization in these peak months. However, they produce fairly few traffic during off-season. According to Tonci Peovic's paper on Alleviating negative effects of seasonality (2008), in these low peak months they cannot shut down half of the airport or fire half of the employees due to technical, legal or sometimes political reasons. One cannot also conclude that they are inefficient or that they are not productive, but one can argue that the methodology used for measuring the productivity should be questioned. Therefore, especially when comparing airports on a yearly basis in a scientific research many problems arise. The sample of airports to be compared should be investigated in detail; the traffic structures should be identified over the year and if possible, the data should be made comparable, Tonci Peovic (2008)

Airports which do not deviate much throughout the year in their utility capitalization differ in many aspects to seasonal airports. Seasonal airports have high oscillations in passenger number as well as air traffic movements. Large airports are much more consistent and thus have fewer oscillations. This variability requires that management meets the need of the peak hours, passenger and employee satisfaction, while making sure that the employees, facilities and other fixed costs will not pose a threat to the airports in times of low air traffic movements.

In this paper we will analyze the effects seasonality has on benchmarking. We will

show through some data that if we use a classical way of comparison of seasonal and non seasonal airports the results will be misleading. Also, we will introduce the Gini coefficient and see how it can be incorporated into seasonality to help with the benchmarking issue. After presenting these effects that seasonal airports have on benchmarking some suggestions will be given on how one can deal with these issues. Some of these ideas are pricing strategies, increasing traffic in the off season, cooperation, outsourcing, flexible labor and so on.

2.0 Literature review

Seasonality is present in many aspects of life. Besides looking just at certain businesses such as airports or seasonal hotels, seasonality can also be present for example in retail sales or studying for exams. Seasonality is quite common in economic time series. It is also very common in geophysical and ecological time series. Retail sales usually tend to peak in the Christmas season, and decline after the New Year. So time series analyses will usually show increasing sales from September to December, and decreasing sales in January and February. Also the number of hours students spend studying for University surely increases as the examination period approaches. A notable example is the concentration of carbon dioxide in the atmosphere.
It is at a minimum in September and October, at which point it begins to increase, reaching a peak in April or May, before declining.

There are several graphical methods for detecting seasonality.

- A run sequence plot will often show seasonality.
- A seasonal subseries plot is a specialized technique for showing seasonality.
- Multiple box plots can be used as an alternative to the seasonal subseries plot to detect seasonality.
- The autocorrelation plot can help identify seasonality.
- Seasonal Index measures how much the average for a particular period tends to be above (or below) the expected value.[1]

For a first step the run sequence plot is recommended for analyzing any time series. For a clearer showing of seasonality a box plot or subseries part is recommended because it shows seasonal differences with group patterns and within group patterns. In table 1 we see an

[1] Internet page: http://www.itl.nist.gov/div898/handbook/pmc/section4/pmc443.htm

example of the plot showing seasonality by comparing the busyness of the winter vs. the summer schedule.

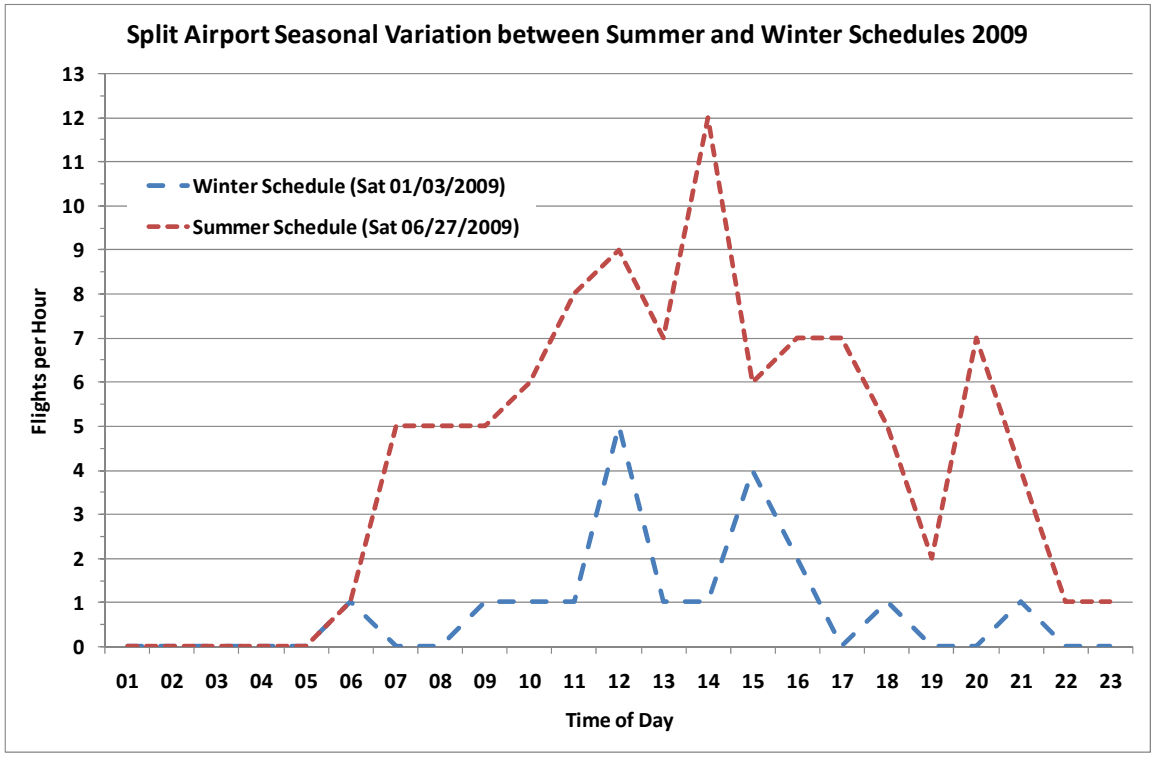


Table 1: Split airport seasonal variation between summer and winter schedules 2009, Ülkü (2009))

Going back to seasonality of airports, we look at what makes a manager of seasonal airports successful. Successful management can be seen through several relationships of indicators like the number of passengers per employee, costs per passengers, but also through indicators like revenue per passenger generated by non aviation activities, (Graham, 2005). The success of many seasonal airports will depend on their ability to execute the following: flexible staff management, efficient equipment usage, flexible space usage and staff multitasking, (Peovic, 2008). So for example, performance can be increased if we have equipment reserves that are used in the peak hour operations. Seasonal airports specialize in having different levels of equipment. New equipment is used in everyday businesses but older and amortized equipment may be used as a tool for the peak hours. Another major task that seasonal airports deal with is employee allocation. Staff costs are usually fixed and it does not matter whether the employees are currently working or not. That is why it is of importance for seasonal airports to have flexible working hours, which are peak dependent.

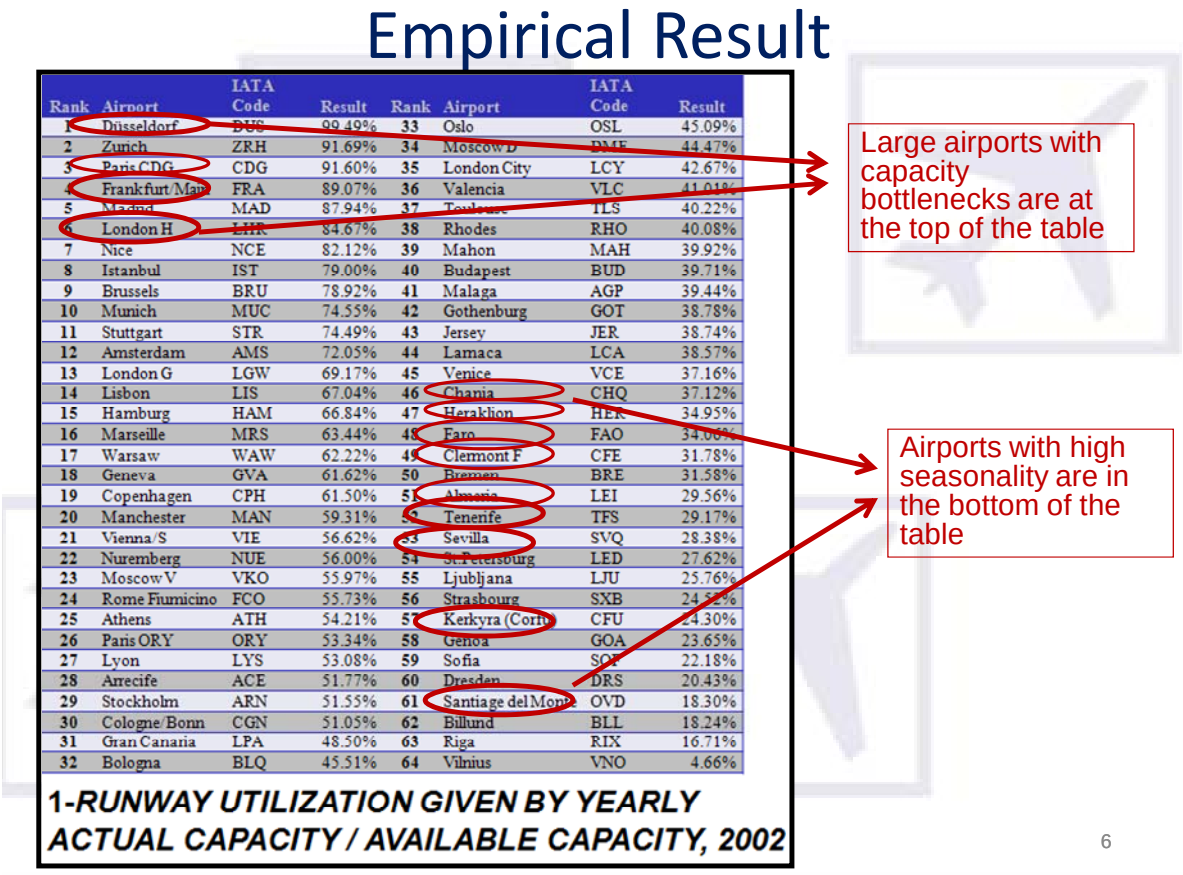
An interesting study was done on customer satisfaction by (Peovic, 2008) during peak and non peak seasons. Customer satisfaction was lower in the summer months which clearly

indicate that their experience is affected by the busy summer period. More than average pressure on employees and facilities can have a negative impact on customer satisfaction. Conversely, airports deliver higher guest satisfaction during November, January and February which are traditionally slower periods for seasonal airports. Guest satisfaction reaches its peak in November. Perhaps during these traditionally slower periods, guests take advantage of reduced rates. They are happier to pay less, and as a result, expect less but are more likely to receive good service because of lower occupancies.

3.0 Analyses of effects of seasonality

3.1 Effects on benchmarking

When analyzing productivity or efficiency of airports, runway utilization is an important indicator. It shows how successful the airports were by giving a ratio of the actual runway usage versus the available runway usage.



Rank	Airport	IATA Code	Result	Rank	Airport	IATA Code	Result
1	Düsseldorf	DUS	99.49%	33	Oslo	OSL	45.09%
2	Zurich	ZRH	91.69%	34	Moscow D	DME	44.47%
3	Paris CDG	CDG	91.60%	35	London City	LCY	42.67%
4	Frankfurt/Main	FRA	89.07%	36	Valencia	VLC	41.01%
5	Madrid	MAD	87.94%	37	Toulouse	TLS	40.22%
6	London H	LHR	84.67%	38	Rhodes	RHO	40.08%
7	Nice	NCE	82.12%	39	Mahon	MAH	39.92%
8	Istanbul	IST	79.00%	40	Budapest	BUD	39.71%
9	Brussels	BRU	78.92%	41	Malaga	AGP	39.44%
10	Munich	MUC	74.55%	42	Gothenburg	GOT	38.78%
11	Stuttgart	STR	74.49%	43	Jersey	JER	38.74%
12	Amsterdam	AMS	72.05%	44	Lamaca	LCA	38.57%
13	London G	LGW	69.17%	45	Venice	VCE	37.16%
14	Lisbon	LIS	67.04%	46	Chania	CHQ	37.12%
15	Hamburg	HAM	66.84%	47	Heraklion	HER	34.95%
16	Marseille	MRS	63.44%	48	Faro	FAO	34.06%
17	Warsaw	WAW	62.22%	49	Clermont F	CFE	31.78%
18	Geneva	GVA	61.62%	50	Bremen	BRE	31.58%
19	Copenhagen	CPH	61.50%	51	Almeria	LEI	29.56%
20	Manchester	MAN	59.31%	52	Tenerife	TFS	29.17%
21	Vienna/S	VIE	56.62%	53	Sevilla	SVQ	28.38%
22	Nuremberg	NUE	56.00%	54	St Petersburg	LED	27.62%
23	Moscow V	VKO	55.97%	55	Ljubljana	LJU	25.76%
24	Rome Fiumicino	FCO	55.73%	56	Strasbourg	SXB	24.52%
25	Athens	ATH	54.21%	57	Kerkyra (Corfu)	CFU	24.30%
26	Paris ORY	ORY	53.34%	58	Genoa	GOA	23.65%
27	Lyon	LYS	53.08%	59	Sofia	SOF	22.18%
28	Arrecife	ACE	51.77%	60	Dresden	DRS	20.43%
29	Stockholm	ARN	51.55%	61	Santiago del Monte	OVD	18.30%
30	Cologne/Bonn	CGN	51.05%	62	Billund	BLL	18.24%
31	Gran Canaria	LPA	48.50%	63	Riga	RIX	16.71%
32	Bologna	BLQ	45.51%	64	Vilnius	VNO	4.66%

Table 2: Runway utilization for 64 airports 2002, Ülkü (2009)

The above table presents an empirical study of runway utilization for 64 airports in

2002. As we can see from above, the larger airports such as Zurich or Paris, use over 90 percent of their available capacity at all points in time throughout this year. When we look at seasonal airports such as Tenerife or Seville we see that they only use about 30 percent of their available capacity per year. Does this mean that seasonal airports are less effective? Also the problem of benchmarking is clearly visible here. Most likely the utility capitalization for seasonal airports in their peak months is between 80 and 100 percent. However, in the non attractive months it drops down to very low figures.

1	Airports		Passengers													
2	Airport	IATA Co	Minimun	Maximu	January	Februar	March	April	May	June	July	August	Septemb	Octobe	Novemb	Decemb
3	Ibiza	IBZ	73,415	848,000	73,415	86,593	109,654	160,100	419,905	591,000	727,700	848,000	627,000	349,000	85,100	78,068
4	Menorca	MAH	47,904	505,200	47,904	53,686	64,819	98,100	293,031	379,700	451,900	505,200	375,900	237,500	62,600	56,509
5	Liege	LGG	5,554	42,300	8,031	7,860	5,554	11,100	21,106	20,700	37,300	42,300	22,300	10,900	6,400	12,772
6	Faro	FAO	133,488	625,300	143,699	197,790	251,956	371,600	490,180	546,300	617,400	625,300	586,500	500,400	179,300	133,488
7	Palma de Mallorca	PMI	687,200	2,951,600	687,200	890,191	1,146,783	1,428,900	2,039,300	2,329,700	2,727,900	2,951,600	2,449,100	2,048,900	886,400	825,000
8	Malta	MLA	123,407	389,200	123,407	134,801	172,004	232,000	252,904	271,800	339,600	389,200	323,200	285,000	159,100	130,953
9	Goteborg	GOT	33,200	397,951	254,687	265,466	326,785	315,600	397,951	386,900	303,700	33,200	390,600	363,300	326,400	286,562
10	Porto	OPO	168,320	360,800	190,331	168,320	179,980	254,700	255,871	332,400	311,400	360,800	284,500	220,700	172,000	213,182
11	Moscow Domodedo	DME	684,125	1,552,700		684,125	752,667	859,200	1,052,958	1,209,000	1,390,900	1,552,700	1,213,000	992,900	818,100	829,078
12	Malaga	AGP	628,600	1,346,600	628,600	739,653	857,137	1,056,100	1,161,400	1,151,000	1,306,700	1,346,600	1,220,200	1,187,500	715,300	657,700

Table 3: Monthly passenger numbers for 12 European airports, ACI-Europe, Airport Traffic Report, monthly, 2004

Table 3 above shows the monthly passenger numbers of some European airports in 2004. The number of maximum and minimum passengers per month in one year greatly differs. These low peak months greatly influence the utility capitalization and therefore the ability to do quality benchmarking.

In the following charts we can see just how much the seasonality effects the utility capitalization of the airport.

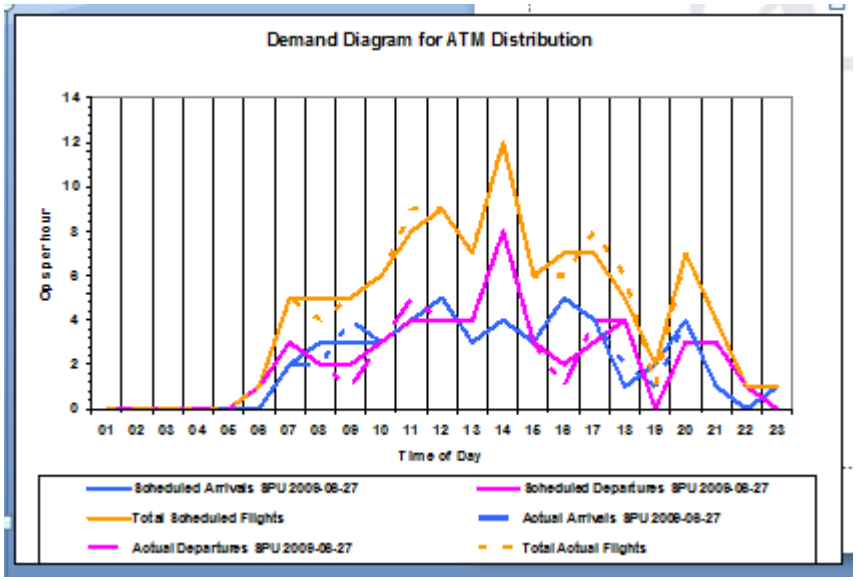


Table 4: Diagram for ATM Distribution at Split Airport on 27.08.2009, Ülkü (2009)

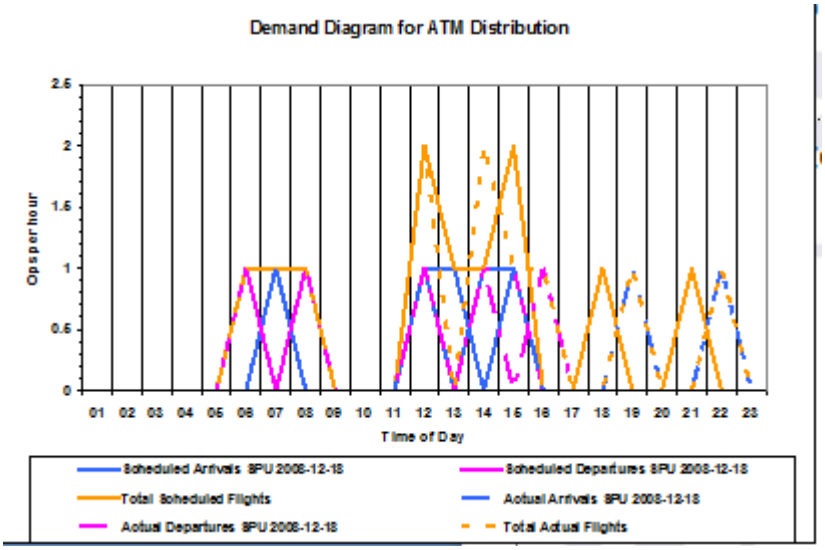


Table 5: Demand diagram for ATM Distribution at Split Airport on 18.12.2008, Ülkü (2009)

Table 4 and 5 show some data for Split airport in Croatia. The first graph shows that on a peak summer total scheduled flights reaches a peak of 6 per hour. Actual arrivals and departures reach the peak of 3 airplanes per hour. The second graph represents a winter day in which the peak numbers are three times smaller. The peak for scheduled flights is 2 per hours. While the peak for actual arrivals and departures are only one flight per hour.

It is clear that we need to adjust this data somehow to be able to have quality benchmarking. One possibility is to have the peak month data represent the whole year. For example, in Ibiza the number of passengers from June until September is between 590 thousand and 850 thousand. This data could be pretty consistent in terms of utilization.

3.2 Gini Coefficient

Another possibility is using the Gini coefficient as a measure of inequality and seasonality in the data. The Gini coefficient is mostly used to examine the relationship between a network of airports in a region and to summarize air traffic distributions for air carriers and at airports.

The coefficient varies between 0 and 1, with 0 representing complete equality and 1 complete inequality. From this we can conclude that the higher the Gini the higher the seasonality will be. The goal is to find a way to incorporate the Gini coefficient into seasonality to downgrade the effects of seasonality. However it is still unclear to what the connection is with the Gini coefficient and utility capitalization. If we multiply the Gini coefficient with utility capitalization we get the following results.

Results

Rank with GINI	Rank without GINI	Airport	IATA	Gini	Utilization	Gini x Utilization	Rank with GINI	Rank without GINI	Airport	IATA	Gini	Utilization	Gini x Utilization
1	33	Mahon	MAH	0,421	39,92%	16,81%	23	27	Cologne/Bonn	CGN	0,103	51,05%	5,26%
2	1	Düsseldorf	DUS	0,115	99,49%	11,44%	24	17	Copenhagen	CPH	0,082	61,50%	5,04%
3	7	Nice	NCE	0,127	82,12%	10,43%	25	5	Madrid	MAD	0,056	87,94%	4,92%
4	38	Faro	FAO	0,272	34,06%	9,26%	26	15	Marseille	MRS	0,077	63,44%	4,88%
5	12	London Gatwick	LGW	0,133	69,17%	9,20%	27	21	Rome Fiumicino	FCO	0,082	55,73%	4,57%
6	8	Brussels	BRU	0,108	78,92%	8,52%	28	6	London Heathrow	LHR	0,052	84,67%	4,40%
7	18	Manchester	MAN	0,135	59,31%	8,01%	29	37	Venice	VCE	0,113	37,16%	4,20%
8	16	Warsaw	WAW	0,125	62,22%	7,78%	30	31	Valencia	VLC	0,088	41,01%	3,61%
9	13	Lisbon	LIS	0,111	67,04%	7,44%	31	29	Oslo	OSL	0,074	45,09%	3,34%
10	22	Athens	ATH	0,126	54,21%	6,83%	32	25	Arrecife (Lanzarote)	ACE	0,062	51,77%	3,21%
11	10	Stuttgart	STR	0,089	74,49%	6,63%	33	20	Nuremberg	NUE	0,054	56,00%	3,02%
12	2	Zurich	ZRH	0,071	91,69%	6,51%	34	26	Stockholm	ARN	0,057	51,55%	2,94%
13	30	Moscow Domodedevo *	DME	0,145	44,47%	6,45%	35	23	Paris ORY	ORY	0,053	53,34%	2,83%
14	11	Amsterdam	AMS	0,084	72,05%	6,05%	36	24	Lyon	LYS	0,05	53,08%	2,65%
15	4	Frankfurt/Main	FRA	0,065	89,07%	5,79%	37	28	Gran Canaria	LPA	0,052	48,50%	2,52%
16	36	Gothenburg	GOT	0,149	38,78%	5,78%	38	42	Riga	RIX	0,129	16,71%	2,16%
17	3	Paris CDG	CDG	0,062	91,60%	5,68%	39	39	Tenerife	TFS	0,071	29,17%	2,07%
18	35	Malaga	AGP	0,142	39,44%	5,60%	40	40	Sevilla	SVQ	0,063	28,38%	1,79%
19	34	Budapest	BUD	0,141	39,71%	5,60%	41	41	Strasbourg	SXB	0,063	24,52%	1,54%
20	9	Munich	MUC	0,074	74,55%	5,52%	42	32	Toulouse	TLS	0,038	40,22%	1,53%
21	19	Vienna/Schwechat	VIE	0,094	56,62%	5,32%	43	43	Vilnius **	VNO	0,123	4,66%	0,57%
22	14	Hamburg	HAM	0,079	66,84%	5,28%							

Changes in the Ranking after GINI Calculations

Table 6: Adjusted capacity utilization, Ülkü (2009))

This definitely reduces the effects of seasonality, but the question about the relationship between Gini and utilization still remains uncertain

4.0 Strategies on how to deal with seasonality

4.1 Infrastructure of seasonal airports and equipment

The fact that there are up to ten times more passengers at one point in the year compared to another brings up the question of design and infrastructure of seasonal airports. There should be main infrastructural areas that can be used in the peak times as well as the non peak periods. However, there also need to be some secondary areas which are used especially for the peak periods. They do not fulfill the same standards of service but do meet passenger requirements and expectations. These secondary areas do not necessarily have to be within the airports, they can also be located short distances away from the airport. For example, there can be check in desks in the nearby hotels, ports or resorts. Boarding passes can be issued in this area, which will cut down on necessary space for the airport and provide the passengers with a user friendly service. Also the luggage racks can be located on the

outskirts of the airports, even up to one kilometer away, (Peovic, 2008)

There is certain equipment that will be used every day throughout the year and other only in the seasonal peaks. Each unit of equipment has a certain amortization or depreciation period. This period will mostly depend on the frequency of use for each unit of equipment. Thus, it makes sense to split this equipment into two groups of quality. The first group would represent high quality material that is used continuously on a regular basis throughout the year. This equipment would of course be more expensive. The other level would represent equipment of seasonal use, which would be of poorer quality and thus lesser price. One has to take into consideration the purpose of the equipment that is to be bought before buying it. Larger airports usually have preset deadline for equipment usage. After this deadline expires, very often even if the equipment is still functioning it is replaced. This gives an opportunity for seasonal airports to purchase it second hand, Anne Graham (2007),

4.2 Employee management

Maintaining an airport can be split up into two basic groups. The first being large scale maintenance which means full or partial reconstruction of structure and equipment. The second being light maintenance which is maintaining, checking, adjusting and replacing of older components. When a maintenance problem emerges it is very difficult to have the exact tools, knowledge, experts and spare parts to fix it right away. Therefore, a well though maintenance plan, training of employees and a stock of spare parts is needed to insure less expensive maintenance.

Most of the maintenance activities should be done in the winter months, when the airports are least busy. Repairs, should be done as soon as the problem is identified. A good example is the Austrian airport Salzburg, where it is required of the ground handling service to also be trained on machine repairs and basic maintenance work, Peovic (2008). When the traffic is low all of them are engaged in repairing and light maintenance jobs. Managers of seasonal airports need to be cost oriented. This means they need to find a ways on handling as many passengers with as few employees as possible, which would increase airport efficiency and productivity.

Allocation of working hours is another key aspect of employee management. The working hours need to be tailored to the duties of the job. Employees with certain job responsibilities need to work longer than others who have less time consuming job responsibilities. Also some days or weeks with higher peaks need to have higher working loads during those times. Having the alternative to higher seasonal workers really helps with

battling the peak season. These are workers who can quickly join the team and work on less demanding jobs without thorough education and on board training. These are usually students who are looking for a summer job and who can help in areas such as luggage, information desk, assisting the elderly and so on. Another important set of workers are permanent seasonal workers, which are more specialized and have higher education and professional training. However they would only work in the peak season when they are needed. This is very hard to find in reality because such skilled workers will prefer to work full time instead of part time. Another obstacle to that are the legal issues, which could prevent managers to prepare and give such flexible contracts. These might stem from strong labor unions, political populism or the socio-economic situation of the society.

This is where the role of outsourcing comes in handy. Since the legislation and union contracts usually disallow such a flexible working plan that a seasonal airport would need. If such hiring of seasonal workers or volatile working hours is improbable or too regulated, then the needed employees could be offered by external companies who offer such services. For seasonal airports, outsourcing definitely comes in handy for professions that do not have a direct operational role, such as maintenance.

It is of the utmost importance for seasonal airports to require multitasking of their employees. Internal staff reserves exist in almost all airports. The nature of airport jobs does not only include handling of aircraft and passenger. A part of staff performs administrative, accounting and marketing tasks usually not connected to arrival and departure of passengers and aircrafts, and can be planned. The same relates to maintenance of structures, equipment or flight safety prevention activities. And even though staff is employed to perform operational passenger and aircraft handling activities according to flight schedule, it will still be able to perform administrative tasks and maintenance of equipment and structures during periods with no flights. The same also relates to winter snow removal, cleaning of driveways, green areas or training of seasonal workers

5.0 Conclusion

In this paper we have given an insight into what seasonality is and what problems it generates for quality benchmarking. Seasonal airports need to have a very different mindset than other non seasonal airports if they want to survive and be profitable on the market. It is up to management to recognize the opportunities and strengths that seasonal airports possess and to minimize the weaknesses and threats that they are surrounded by.

We can clearly see that we cannot ignore seasonality in benchmarking. The effects it

has on the utility capitalization data are tremendous and cannot be ignored. One possibility to look into is the Gini coefficient. This coefficient definitely points out the inequality in data and is clearly higher for seasonal airports. However, it is still uncertain how it cat in be incorporated into the data and what exact connection it has with seasonality.

Seasonality is a very interesting topic in aviation. There are a number of potential subtopics which can be researched. It would be very interesting to compare the cost and revenue structure of seasonal and non seasonal airports. A clear assumption is that seasonal airports are much more fluctuating in revenues but maybe not as much in costs in comparison to non seasonal airports. Computing the break even analysis would also be a useful tool for contrast of the two types of airports.

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