

# The Consequences of De-hubbing for Airports and Tourism - a Case Study

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## Abstract

The size of airports depends on passenger traffic to and from that city as well as the number of passengers connecting from one flight to another flight. When hub airports lose a significant amount of connecting flights ('de-hubbing'), their growth is negatively affected and in many cases does not reach previous levels. This has serious implications for the airport operator as well as the tourism industry, which may lose incoming visitors from markets no longer connected to the airport. The case of de-hubbing of Budapest airport of February 2012 shows that under certain circumstances, very good traffic recovery rates can be achieved. Important drivers for the recovery rate are the type of airline taking over lost routes, the demand for inbound tourism and capacity offered on selected markets, and the dominance of a certain type of airline (alliance/low cost). This paper extends the research done by Redondi *et al.* (2012), but also has relevance for airport and tourism managers faced with airline bankruptcy and policy makers.

**Keywords:** tourism, competition, airline bankruptcy, airport management

## 1. Introduction

Airports are called hubs, when a significant share of their passengers is travelling neither to nor from their city, but connect from one flight to another airline. Because such flights carry both connecting and direct passengers, airlines can serve destinations which without a hub would not be economical. Airports benefit because the number of passengers and flights being handled grow beyond the natural potential of the destination, because it is driven by the size of the network of the home airlines. De-hubbing occurs when hub carriers partly or wholly withdraw from an airport, often caused by bankruptcy, and transfer traffic declines significantly. Many airports are unable to ever reach traffic levels prior and face serious financial consequences. This paper discusses the effects of de-hubbing on tourism and the rate of recovery, aiming to answer the following questions:

- What effect does de-hubbing have on inbound tourism revenues?
- What are the antecedents of that effect?
- Does traffic recovery occur in a linear, exponential or S-type fashion over time?

The paper is organised as follows: First we provide a short literature overview and conceptualise the cause-effect relationships to be discussed. A number of propositions are offered. Then, we present the case of a complete de-hubbing when a hub lost its main carrier in early 2012. Next the propositions are discussed in light of the case study, followed by limitations, managerial implications as well as possibilities for future research.

## 2. Theoretical background and conceptualisation

The future commercial success of airports is heavily influenced by size of the passenger potential for this airport. It may be argued that airports offering not only direct flights to and from that city but also connecting flights have a larger passenger potential. With passengers' volumes being a strong driver of income, it can be a strategic objective of an airport to offer connections, and be a 'hub'. However, decisions to establish hubs and their size and shape are driven by airlines, and more and more airlines are struggling to make a profit, or even to stay alive. Caused by a series of crises in the airline industry, starting from the events of September 11<sup>th</sup>, 2001, followed by the spreading of SARS, and then an unprecedented increase in kerosene prices in late 2005, airlines have been under severe pressure. Crises such as these can cause a reduction of an airport's connections, either by a hub carrier's bankruptcy or by the carrier's choice to restructure their network (Dudden 2006). Despite the serious negative effects that de-hubbing can have on economic performance, there are only few studies investigating its effects on the airport. Bahdra (2009) suggested that de-hubbing was a strategy applied by airlines to reduce losses occurred at multi-hub operations, but does not discuss the impact on affected airports. Borenstein & Rose (2003) review the effect of bankruptcy in the US (Chapter 11) on air services at airports, and conclude that in large or small airports, the number of air services is not significantly affected by an air carriers bankruptcy, while

medium sized airports (defined as having 100 to 400 departing flights/day) are. Redondi *et al.* (2012) define de-hubbing to take place when the number of viable connections per month reduces by 75% compared to any previous month (covering both cases of sudden and gradual de-hubbing). They identify 37 cases of de-hubbing during 1997-2009 (small airports or those closing after de-hubbing were excluded), and propose that the outcome of de-hubbing can be classified into five scenarios: Airports recovering the number of connections are 're-hubbed'. Airports dominated by alliances, low cost carriers (LCC) or unallied airlines after five years fall in to three further distinct categories, and all other cases form the fifth category, termed 'battleground'. From an airport perspective, the most favourable outcome was the "low-cost dominated" scenario, which involves LCC increasing capacity to an extent which makes this the dominant category at the airport. This was the case in Birmingham, Basel-Mulhouse, East Midlands and Glasgow, which led to Flybe, EasyJet Switzerland, bmibaby and easyJet to become dominant and overall LCC seats to exceed 50% of capacity. These airports also had the quickest recovery in number of seats offered. All other scenarios are very negative, and full recovery for those airports is unlikely (Redondi *et al.* 2012).

There are, however, a number of drawbacks when airports become low cost dominated. As the tourism industry in most countries heavily depends on being connected to key sending markets by air as well as sufficient seat capacity being offered, the loss of a hub can be expected to have a significant impact on tourism revenues, too. Firstly, some routes will only be viable because of the connections offered by a hub, therefore the airport is likely to have fewer routes afterwards, and therefore the country will be accessible from fewer inbound markets. These are likely to be smaller markets, because if they were significant, the routes would probably be viable even without connecting passengers. Secondly, a lower seat capacity after de-hubbing may lead to price increases of air tickets, which in turn makes travel to the destination more expensive, leading to fewer inbound tourists (Tan 2012). On the other hand, there could be some positive effects as well. If capacity on a route is suddenly dropped because of bankruptcy, potential future profits are higher, because re-entry is not likely, and many customers will be looking for new alternative offers at once. Attractive markets may be entered by several airlines at once, leading to oversupply, which may then result in lower fares and excess capacity.

- P1: Sudden de-hubbing followed by capacity dumping on certain air markets increases inbound tourism from those markets.

Next, a dominant hub airline may discourage competitive market entry, and lead to higher price levels (Borenstein 1989, Evans & Kessides 1993). The absence of a dominant carrier would consequently lead to more competition and – assuming no new dominant player appears – lower fares at higher seat availability, both benefiting inbound tourism. We propose that:

- P2: Recovery of inbound tourism is stronger after de-hubbing when the airport is not dominated by an airline/alliance then if it is dominated afterwards.

If the growth is fuelled by a LCC, it is worth to compare the effect their different business model has on tourism. LCC tend to use larger aircraft on short haul flights than others. Therefore, an increase of the share of LCC with equal frequencies leads to more seat capacity offered. LCC also realise higher seat occupation, and due to a higher ancillary revenue (such as excess baggage fees etc.) and lower operating costs than traditional airlines are able to sell seats at lower fares, this stimulating local traffic more successfully than traditional carriers. We therefore propose:

- P3: De-hubbing followed by a significant increase of the LCC share increases inbound tourism

Next we turn to aspects of recovery. By definition, de-hubbing consists of a company exiting several air travel markets. With air travel being a highly competitive industry, we assume most incumbents are actively monitoring competing players, and aware of the dynamic nature of competition (Roberts *et al.* 2005). Therefore de-hubbing is likely to first (phase 1) result in a wave of reactions from incumbent firms as well as market entry by new firms. We consider each destination connected to the airport before by a non-stop flight to be an individual market. After de-hubbing, markets could remain either completely unserved, other markets could become massively competitive (for example when both incumbent airlines increase capacity and new airlines enter) and some markets could change into a monopoly (for example when only one airline is permitted to fly due to regulatory or technical restrictions). Other markets will retain a 'normal' level of competition. Furthermore, one could assume that in the second case, prices will decrease on the market – leading to a stimulation of passenger traffic – while in the third case, prices will increase. Then, in phase two, the market players will have had time to gain experience with the new market situation, and have made a further range of entry/exit decisions. Due to the

need to scheduling aircraft and crew as well as sell tickets well in advance, the second ‘wave’ of reactions is likely to be 6 - 12 months after phase one.

A most relevant question for the airport is if the recovery rate of the overall traffic in phases one and two. To determine this, assumptions need to be made about the competitive intensiveness and capacity offered for the respective markets, over time. This, in turn, requires an understanding of the attractiveness of the markets affected by de-hubbing. Because all players have more understanding of the attractiveness of markets, and also some or all players on markets will have occurred losses during a first phase, it is most likely that overall capacity and competition will decrease in a second phase. Irrespective of the size of the recovery rate, we therefore postulate that:

- P4: The rate of traffic recovery after de-hubbing will first increase, then decrease, then increase again over time (S-shape).

Next we will discuss these propositions in further detail and test their application in a recent case of de-hubbing. The case study methodology is an “empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used” (Yin 1984, p. 23). It is appropriate to use in this case, because the existing knowledge of de-hubbing is still limited, and there are no generally accepted conceptual frameworks explaining the causes and effects, to the best of our knowledge. Also, the two cases presented here are unique, and were selected with the intention to give suggestions for further research, which could lead to a general model (Hamel *et al.* 1993). The case method has certain limitations, including a lack of generalizability of the results and the bias caused by the researcher’s extensive exposure to the cases. We consider the insights from these cases to be important enough in the development of new knowledge to outweigh the drawbacks, and encourage reading on, with the above limitations in mind.

### 3. Budapest airport – a case of sudden de-hubbing<sup>12</sup>

On 3rd February, 2012, the main hub carrier of Hungary’s Budapest airport stopped operations due to lack of funds. At that time, the airline accounted for 37% of the airport’s annual passenger traffic, and carried most of the airport’s 3.2 million transfer passengers. The airport also lost its only two long-haul airlines American Airlines and Hainan Airlines as a result of the weakened connectivity at the hub, and transfer traffic reduced by 99% immediately (see Table 3). Malév’s network consisted of a wide range of routes in Europe and the Middle East, and its schedule structure was optimized to allow efficient connections in the North-South and West-East directions. At a route level, however, the share of transfer passengers differed significantly. Some destinations carried very few transfer passengers, which could be caused by either a high demand of the local market segment, or a lack of connectivity, others had a very high share of transfer passengers. Because no other airline offered the possibility to connect in Budapest, the routes with a high transfer share were the most likely to remain unserved. Malév operated on 45 routes with own aircraft. By the following summer season, 19 new routes have been announced by 5 new airlines. The most significant announcement was made by Ryanair’s CEO who promised a “rescue plan for Budapest and Hungary tourism” (Anonymous 2012), subsequently launching 28 routes within weeks. By mid-summer, 13 incumbent airlines increased frequencies on their routes. 16 routes have not been taken over at that time, and also 18 months later, still 14 routes are non-served. Budapest’s biggest carrier, Wizz Air stated that a new aircraft joining their Budapest base in March 2014 will only be used to increase the frequency of existing routes (Landry 2013). This suggests that within two years after the event, all market opportunities caused by the demise of Malév may have been taken up, and therefore the recovery process may have largely been completed.

We will now further discuss the five propositions suggested above, and assess if they can be upheld in this particular case of sudden de-hubbing. The intention is to give further substance to the proposed relationships, and suggest them for further investigation using a larger sample.

#### *Capacity dumping and inbound tourism*

Starting from February 2013, carriers started to add new routes and increase capacities on existing routes. It

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<sup>12</sup> All data related to schedules and routes to/from Budapest were obtained from the airport’s operator Budapest Airport Zrt., between August and September 2013, unless otherwise marked in the text.

could be expected that market forces lead to attractive markets receiving a higher increase in capacities than less attractive markets, which in some cases may also lead to an excess in capacity, which we term capacity dumping. For the purposes of this paper, capacity dumping is defined as increasing air service capacity between two countries in a way which leads to total annual capacity being 15% more compared to the year before. The value of 15% was chosen, because this mark is significantly higher than European tourism growth and average GDP growth in any European market, therefore indicating that capacity increases do not follow market demand, but are likely to be a strategic move in the competitive interaction by airlines, involving excess supply. We compared the change of annual departing seat capacity at Budapest airport for the full year 2012 compared to previous year with the change of registered international visitors at Hungarian hotels during the same period. Although 2012 full year data includes one month before de-hubbing (January 2012) we still decided to use annual data, because tourism data was available only for a full year. We identified six markets (see Table 4), and while average growth of international visitors to Hungary increased by 15.9%, three out of these markets grew by between 23% and 29% (Norway, Belgium and Ireland). The other markets (Spain, Italy and Poland) suggest that Hungary may be more attractive as a holiday destination in these Northern markets, while flights to Spain and Italy may be easier sold to Hungarian holidaymakers. The increase to Poland could be explained by increases by Poland's home carrier aiming to carry Malév's past traffic via their hub in Warsaw, but also by Ryanair and Wizz Air "fighting hard for leadership in Hungary and Poland" (Anker 2012, p.1). Therefore capacity dumping is likely to lead to growing international visitors in case of markets with a sufficient demand for inbound travel, but not in case of typical outbound markets, such as Spain.

In total, annual capacity was 6.8% lower than previous year, dropping from 5.7 to 5.3 million seats on departing flights. The average growth rate varied quite significantly from country to country, and some countries had increases of up to 100,000 seats per year (United Kingdom) while others declined by almost 100,000 (Romania). Figure 1 plots each country connected by flights to Hungary on one axis showing the incremental number of seats offered in 2012 to Budapest and on the other axis showing the incremental visitors coming from that country compared to the previous year.

The mean change of capacity per route was -18,449 seats, with a standard deviation of 42,945. The markets increasing significantly were U.K., Belgium, Spain and Italy, which probably seemed attractive enough for several carriers to enter the markets with high capacities. The markets most negatively affected were all in Eastern and Southern Europe (Ukraine, Romania, Serbia, Czech Republic, Bulgaria, and Greece). These were served by flights of Malév which carried predominantly transfer passengers and were not attractive enough for point to point carriers. 8 of 41 countries showed a growth of over 10,000 seats, 19 showed a decline of over 10,000 seats and the remainder was between the two categories ('stable'). Where capacity grew, visitor numbers grew, or in one case remained stable ('stable', defined as less than 5,000 visitors growth or decline). Where capacity declined, also visitor numbers declined or remained stable, except in 6 cases. Three of these countries were neighbours, suggesting that not air travel but land transport drives inbound tourism. The other three countries are Russia, Sweden and Turkey. In these cases, Malév stopped flying, and only the incumbent carrier remained, which in case of Russia and Turkey was their home carrier, which naturally carried a larger percentage of inbound passengers. Sweden's increase cannot be easily explained. Possibly this is an outlier, where other external factors (such as a strong increase of the demand in Sweden) could play a role.

#### *Losing a dominant airline and inbound tourism*

Redondi *et al.* (2012) assigns airports with no dominant carrier after de-hubbing to the 'battleground' category, which involves competition among airlines and is the least preferable outcome for airport operators. Contrary to that, we argue that the loss of a dominant carrier may actually increase inbound tourism. To investigate this, we compare the case of Budapest airport with the de-hubbing case of nearby Prague airport, which occurred at about the same time. Budapest airport falls into the category of 'battleground' (LCC occur for 45%, the largest alliance group accounted for 22% of the seats), while Prague airport falls into the alliance dominated group (51% of the seats) even after de-hubbing.

Traffic at the airport started to decline at the start of the winter season 2008, when ČSA faced major financial difficulties. The airline started a wide ranging restructuring programme, which was aimed at preparing the carrier for privatisation and avoiding bankruptcy. In April 2013, 44% of the company's shares were acquired by Korean Airlines Co., Ltd. and new routes were launched in the same year which may lead to a gradual re-hubbing of the airport (e.g., Prague-Seoul). For this investigation, we determine the start of de-hubbing to be the first month showing a decline of overall traffic of more than 10%, and the end a growth of over 10%. Between September

2008 and May 2013 the number of destinations by ČSA reduced from 65 to 41 (-37%). The number of transfer passengers at Prague airport in May 2013 was 70% less than during the same period 5 years prior, and only represent a share of 6% of the total traffic. The total traffic is 15% less than before de-hubbing.

ČSA cancelled routes which were probably either not viable without a hub as they were not taken up by other carriers (e.g., Bologna, Cairo), routes which were taken up by others (e.g., Riga, Venice) and routes which were probably profitable but had to be given up as a compensation for the negative effect of state aid on other airlines (e.g., Munich, London, see European Commission 2012b).

In both cases discussed here, de-hubbing has led to the main national carrier's share of the airport's annual traffic declining. In the case of Budapest, Malév's share dropped from a stable 41-44% during the years 2007-2011 to nothing in February 2012, while ČSA's reduction of capacity in 2008 and 2009 first did not lead to any reduction in share because other airlines reduced, too, but then dropped from 48% in 2009 to 43% (2010), 40% (2011) and then 29% (2012).

Figure 2 shows the share of the airline at the respective hub in the primary vertical axis and the growth of visitors in the respective country in the secondary vertical axis. The plot suggests that tourism growth is not related to the share of a dominant airline in the case of neither airport. In fact, both countries' visitors grew while the share declines in 2012 compared to the previous year. This approach therefore provides no evidence for Proposition 2. However the approach contains some limitations. Firstly, the tourism data used is on a national level. The Czech Republic has a number of other significant international airports, and also a number of tourist centres which are not close to Prague airport, while a significant proportion of Hungary's tourism is concentrated on the Budapest area and Balaton (2 hours from Budapest). Secondly, tourism data includes a significant share of visitors using ground transportation, which strongly influences these results.

#### *Higher LCC share and inbound tourism*

Proposition 3 assumes that after de-hubbing, a higher share of LCC capacity has a positive effect on the growth rate of tourism, which could be operationalized as a positive relationship between LCC capacity and the growth rate of inbound visitors to the region. We ran a linear regression using 24 months of data (January 2011-December 2012) which included 13 months of data before and 11 months after de-hubbing. The results showed no significant relationship between the two, and a very low R square. Next we compared inbound visitors growth before (10 months data) and after (10 months data), and found that there was no significant difference between the means of the two periods ( $M1=0.115$ ,  $SD1=0.064$ ,  $M2=0.092$ ,  $SD2=0.028$ ). We can therefore conclude that the growth of inbound visitors is not driven by the share of LCC at an airport.

#### *Recovery of lost transfer traffic over time*

We investigated the relationship between time (independent variable) and the rate of recovery (the number of incremental passengers during a given month compared to the number of transferring passengers during the same month in the year before de-hubbing, dependent variable). We hypothesised the relationship to be S-shaped, involving first a positive, then a negative sign. When plotting the recovery rate against time, data points almost exactly follow an S-shape during the first 10 months. After that, however, recovery rate drops steeply and then shows a high variation from month to month. How can this be explained? Essential to the recovery process at Budapest airport was the fast reaction by Ryanair to base 5 aircraft and launch 28 destinations only weeks of the de-hubbing taking place. Two of these aircraft were removed again in November, leading to a temporary drop in recovery rate. The rate increases again from February – one year after the exit – because by this time, also airlines with a longer planning cycle have had time to adjust their flying programme and launched new routes. Finally, three high frequency routes (Moscow, Istanbul, Tel Aviv) could be recovered only over one year after the exit due to bilateral restrictions. The Hungarian government designated Wizz Air as the Hungarian carrier on these routes, which was accepted by the other countries only after lengthy negotiations. This positive effect was sufficient to compensate the negative effect of the above mentioned Ryanair cutback.

Before estimating a regression model, we considered to control for these effects, for example by excluding Ryanair traffic, which seems to be highly influenced by negotiations with the airport. On the other hand negotiations may have taken place with many airlines, and in fact the recovery at airports is driven by airlines such as Ryanair moving in. We therefore did not adjust the data, but advise to analyse with the above comments



in mind. A series of regression models were ran with SPSS 20. Data consisted of the rate of recovery of each month between February 2012 and July 2013 (n=18). A rate of recovery of 1 means that traffic growth has fully compensated the lost transfer traffic of the given month. In order to test the s-shape, we first propose a cubic model, described with  $Y'$  being the predicted rate of recovery as:

$$Y' = a + b_1t + b_2t^2 + b_3t^3 \quad (1)$$

Results for the cubic model are encouraging despite the outliers as discussed above ( $R^2=.480$ , 17 d.f.,  $P<0.05$ ). In order to assess if other regression models provide a better fit, we also ran a linear, quadratic, logarithmic and s-curved regression (see Table 7 for results). Surprisingly, a quadratic model involving the recovery rate to first increase, and then drop again, delivers very similar results ( $R^2=.455$ , 17 d.f.,  $P<0.05$ ). This equation however would mean that recovery peaks, and then continues dropping. IBM/SPSS 20 also offers an *s-curve* regression model, which assumes the following relationship:

$$Y' = e^{a + \frac{b_1}{t}} \quad (2)$$

The increase in  $R^2$  from the cubic to the S-curved equation is significant ( $P<0.01$ ) suggesting the s-curve model explains more of the data's variation. Next we use Akaike's Information Criterion (AIC) to compare the models (Motulsky & Christopoulos 2004). Based on information theory, the AIC assesses the goodness of fit of models, while also penalising for the number of estimated parameters, thus preferring a simpler model unless justified. The S-curve model reaches the lowest AIC value, and is therefore the preferred one.

The parameters were estimated to be  $b_0 = 0.0484$ ,  $b_1 = -2.677$  ( $R^2=.828$ , 17 d.f.,  $P<0.001$ ). This assumes that full recovery will be reached within 19 months. Despite the curve model being S-shaped, the parameters lead to no period with actual decline in recovery rate, therefore we cannot find evidence for Proposition 4.

#### 4. Findings and Discussion

The case presented here illustrates effects of a sudden de-hubbing on the airport's traffic development within the first 18 months, as well as subsequent changes in the volume of international visitors to the country. In recent years, the number of de-hubbing cases has been increasing, and have serious financial consequences for airport operators (Redondi *et al.* 2012). This case involves an airline bankruptcy, which led to transfer traffic dropping by 99% and the share of low cost traffic to that airport increasing from 26% to 52% within a few months. Then, one year after de-hubbing took place, the supply of air services was again adjusted. By that time, all airlines had time to react to the new market situation, but also some airline reduced routes or frequencies after unsatisfactory results during the first phase. This led to the share of LCC dropping again. The recovery rate of lost transfer traffic exceeded 80% for most of the second year, as point-to-point traffic increased strongly. In year one, seat capacity was down only 8.9%.

This is an exceptionally strong recovery, compared to similar cases. Following the classification of Redondi *et al.* (2012), this airport faced a 'battleground' situation, and four similar cases on average have experienced seat capacity reductions of 21.0% in year one, and 22.3% in year two, namely Albany, Orlando, New Orleans and Milan Malpensa (Redondi *et al.* 2012). The de-hubbing was complete and sudden, which – compared to a case of gradual de-hubbing– gave entrants a signal that re-hubbing by the same airline was impossible, and that large segments could be attracted quickly. A wave of new airlines and new routes were brought to the airport at the same time, which also stimulated traffic with low fares. In comparison to a 'slow and painful' de-hubbing, this may be a preferred scenario in terms of traffic recovery. Recovery of traffic does seem to follow an S-curve model, which over time first increases at a high rate, then at a lower rate, and again at a higher rate. Full recovery was calculated to be reached after 19 months. The scatter plot (Figure 3) suggests that there is a strong seasonal effect, and future research should consider correcting for these effects. However the approach presented points into an important avenue for further research, as not only the antecedents of traffic growth, but also drivers of the shape of the recovery curve contain important information for airport planning.

Because 99% of the country's air services use this airport, this case also allows to analysis the direct relationship between capacity and inbound tourism. We have not yet identified any study investigating the effect of de-hubbing on inbound tourism. As expected, increases of seat capacity of air services lead to an increase of inbound visitors from that country. The strength of the relationship is likely to be mediated by the relative attractiveness of the origin and the destination country, because routes to for example Spain have led to less increases of inbound tourism then routes to Belgium. In the case discussed, inbound visitor number has increased by 9% in the first year after de-hubbing, while the airport's capacity has decreased by 9%. While the airport is

struggling to recover, it appears that the tourism industry has overall benefited from the de-hubbing, despite the significant economic negative effects in other sectors. A study conducted in Hungary calculated the spending of visitors arriving by air, including items such as accommodation, meals, buying souvenirs and so on. In 2009 the spending of arriving visitors by air was on average 516 EUR. This figure includes direct and indirect effects of tourism spending (Dusek *et al.* 2010). Multiplying this figure with the actual number of incremental visitors in 2012 suggest the growth of tourism has led to an incremental spending of 170m EUR. In contrast to this, the Hungarian government estimated the economic effect of losing the national airline Malév to be 46-62 m EUR (tourism revenues and payments to Malév suppliers, Ministry of National Development 2011).

Interestingly, the two cases Malév (sudden de-hubbing at Budapest) and ČSA (gradual de-hubbing at Prague) have both been investigated by EU authorities (European Commission 2012a, 2012b), with the outcome supporting the changes introduced by ČSA (announced in September, 2012) but not supportive of Malév (announced in January, 2012). As expected by the Hungarian government (Ministry of National Development 2011), this verdict triggered the airline's bankruptcy. While a detailed comparison of the two decisions is out of scope, the EU's reasoning for supporting the changes at ČSA is probably related to the significant compensation which it offered to competitors. This included a commitment to reduce aircraft fleet by more than 50% between 2009 and 2014, to eliminate or reduce its capacity on 16 profitable routes and to forego slots at London Heathrow (against a fee) and other congested airports (without a fee, European Commission 2012b). The intention behind these measures was probably to ensure effective competition leading to market level prices. From an airport's perspective, however, this approach has led to a reduction of 26% in movements and 14% in passengers during the first four years of restructuring (as of 2012 full year). The study by Redondi *et al.* (2012) allows benchmarking this outcome against other comparable de-hubbing scenarios. The authors categorised cases depending on the market situation afterwards, and calculated the change of seats offered (cleaned for effects of seasonality) over 4 years since de-hubbing. The average recovery rate by airports with no dominant airline segment (low-cost, unallied, alliance) was a capacity reduction of 25%. Prague airport's traffic declined by 19% (2012 vs. 2007) which is worse than Budapest which has a positive growth within two years since de-hubbing. One could argue that the 'slow and painful' de-hubbing scenario favoured by the EU Commission has resulted in the worst possible outcome for the airport in terms of traffic. It should be noted, however, that the Czech government – majority owners of both ČSA and Prague Airport, may have overall benefited, for example due to the national airlines direct and indirect contribution to the countries's GDP and employment, while Malév's bankruptcy affected 2600 employees. On the other hand, the overall growth perspectives of airports are much higher in the presence of a hub, and therefore in the long term, re-hubbing, such as in the case of Zurich after the demise of Swissair (Dennis 2005), may lead to better results for the airport operator. From the perspective of a tourism, which is only indirectly benefiting from connecting flights, the above effects suggest that the EU ruling against Hungary may have been a blessing in disguise for the local tourism industry.

## 5. Limitations and directions for further research

The approach presented in this paper has a number of limitations. As with each case study it is only an illustration of a one off event, and may not be comparable to other situations. Traffic recovery is dependent on many other factors, such as the attractiveness of the destination, economic strength of the country and main trading partners, airport charges and incentives, available fleet by potential new airlines and so on. These were not discussed in this paper. The relationship between inbound visitors and seat capacity does not consider that a majority of visitors arrive by land transport. While access to data for inbound tourism by air is often difficult, this could improve the strength of the relationship further. With this case being relatively recent, only 18 months of data was available and another review of the long term effects of de-hubbing may be desirable.

This paper was intended to provoke further research into the antecedents and effects of de-hubbing. Firstly, we suggest investigating the impact of de-hubbing on tourism using a larger sample of airports. Secondly, we noted that the sudden de-hubbing scenario presented here was followed by an exceptionally fast recovery. We propose to investigate how the type of de-hubbing (sudden vs. gradual) influences the rate and magnitude of traffic recovery with a larger sample of airports.

## 6. Conclusion

This paper investigates a case of sudden de-hubbing, where the bankruptcy of an airport's only hub airline led to the loss of practically all connecting flights. Recovery was exceptional, and 80% of lost transfer traffic was

recovered about one year after the event, leaving the airport with a seat capacity of only 8.9% less than during the last year before. The recovery continues and a regression based forecast suggests that full recovery takes 19 months. Airports in comparable situations (Albany, Orlando, New Orleans and Milan Malpensa, Redondi *et al.* 2012) have experienced seat capacity reductions of 21% in year one, and 22.3% in year two. The route network of the airport changed, with a significant number of unviable routes remaining unserved, but others having been taken over by other airlines, in some cases leading to capacity dumping. In these cases, paired with demand for tourism to Hungary (e.g., from Belgium, U.K. and Norway), the stimulated traffic also led to over proportional increases in inbound tourism. The share of low cost traffic increased significantly, but 18 months after the event, the airport is dominated by neither LCC, nor alliance members.

The paper's contribution is that it investigates the effects of de-hubbing on tourism, which to our knowledge has been published to date. It analyses a case of de-hubbing which compared to most other cases (Redondi *et al.* 2012) seems to have had a favourable outcome for the local tourism industry. In fact, the additional income of tourism to the affected country was so significant, that one may be pushed to conclude that tourism income develops independently of the presence of a hub airline in some cases, or – in case of that airline's bankruptcy – may lead to scenarios which are positive for the tourism industry. While the airport's operator handled 9% less capacity, the number of international visitors grew by 9%, who spent an estimated 170 m EUR more in the country than in the year prior to de-hubbing. At the same time, however, de-hubbing leads to lack of access to a number of markets, serious negative impacts on the competitiveness of the country's economy and trade relations as well as reduces employment. These effects, however, were out of scope for this study.

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**Table 3. Monthly Passengers at Budapest Airport and Transfer Share (2011-2012)**

	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
2011 Total Passengers	526,921	487,858	637,468	734,461	776,704	827,457	950,396	958,559	894,188	845,815	646,171	634,655	8,920,653
Malév Passengers	172,993	156,336	218,801	260,525	261,125	290,717	362,194	359,923	344,698	343,936	252,601	255,533	3,279,382
Transfer Share	15%	14%	13%	16%	14%	16%	20%	19%	18%	20%	17%	18%	
2012 Total Passengers	568,782	424,633	580,977	712,064	758,243	795,679	892,015	895,183	840,417	796,721	642,326	596,980	8,504,020
Malév Passengers	230,840	13,354	0	0	0	0	0	0	0	0	0	0	244,194
Transfer Share	20%	2%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%

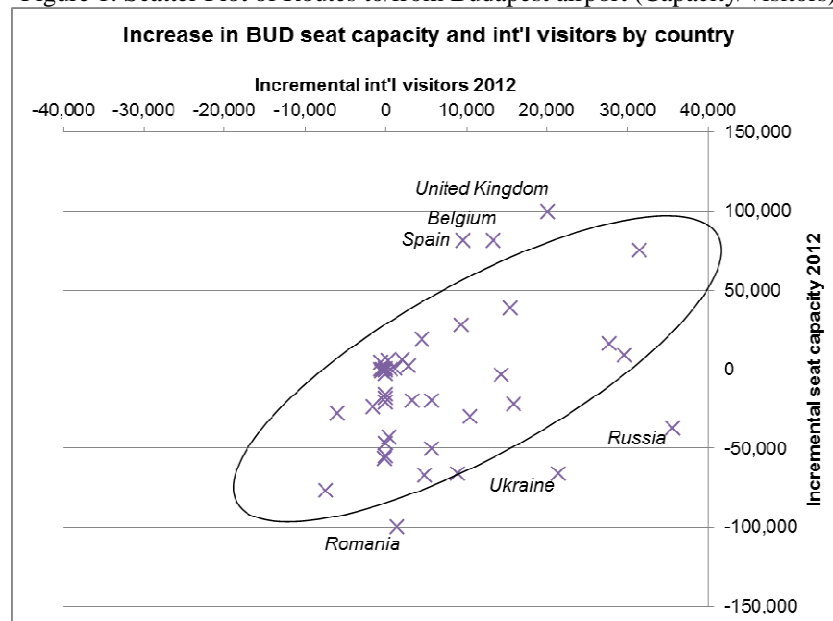
source: Budapest Airport data

**Table 4. Largest Growing Markets to/from Hungary (Seat Capacity and Visitors)**

Markets	2012 Capacity to/from Hungary		2012 Int'l visitors to Hungary	
	Seats	growth (%)	Visitors	growth (%)
Norway	82,512	50.5%	44,916	26.4%
Spain	254,726	46.7%	143,604	7.2%
Belgium	294,711	38.1%	71,257	23.0%
Poland	163,264	31.0%	194,035	8.6%
Ireland	120,897	18.5%	20,160	28.6%
Italy	504,318	17.5%	229,022	16.0%

source: based on data from Budapest Airport and National Statistics Office (KSH)

Figure 1. Scatter Plot of Routes to/from Budapest airport (Capacity/Visitors)



source: based on data from Budapest Airport and National Statistics Office (KSH)

Table 5. Relationship between Change of Seat Capacity and International Visitors (2011-2012)

BUD dep. seat capacity	No. of countries	International visitors to Hungary		
		Declining	Stable	Growing
Growing		0	1	7
Stable		0	12	2
Declining		2	11	6

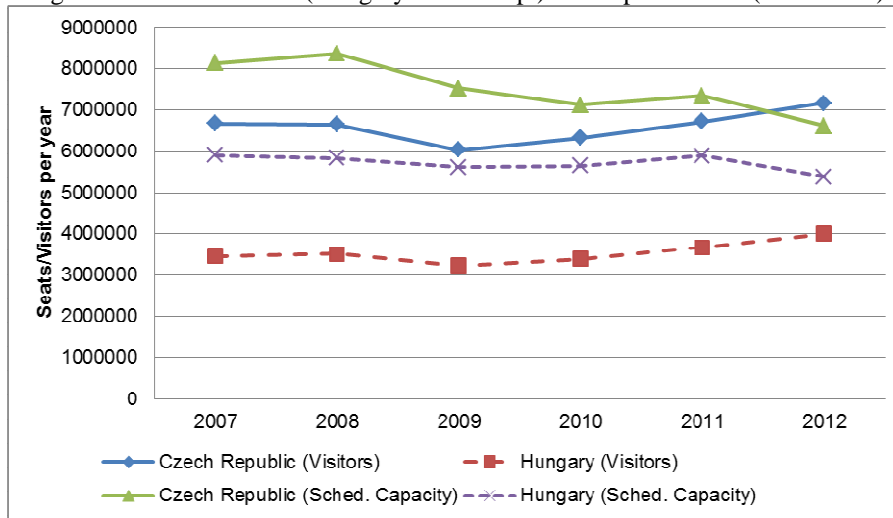
source: based on data from Budapest Airport and National Statistics Office (KSH)

Table 6. Decline of Passenger Traffic and Flights at Prague Airport (2009-2013)

Percentage of reduction vs. May '08 - Prague Airport					
	May '09	May '10	May '11	May '12	May '13
Passengers	-14%	-12%	-6%	-19%	-15%
Transfer Pass.	-7%	-2%	-10%	-66%	-70%
Flights	-11%	-13%	-20%	-31%	-28%

source: Prague Airport

Figure 2. Annual Visitors (Hungary/Czech Rep.) vs. Airport Traffic (BUD/PRG)



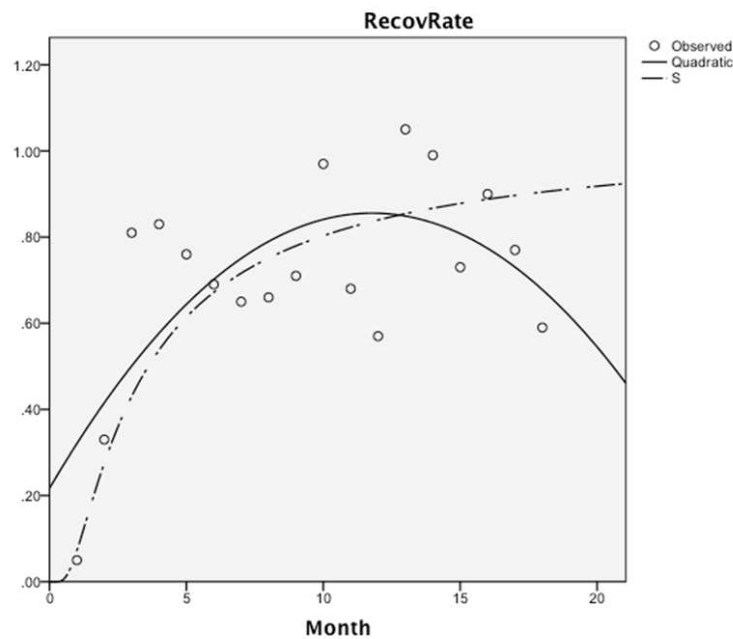
source: based on data from Budapest airport, National Statistics Office (KSH) and Prague Airport

Table 7. Fit of Alternative Regression Models (Y=recovery rate, t=time)

Model	Equation	R Square	Std. Error	AIC
Linear	$Y = b_0 + (b_1 * t)$	.225	.214	-51.544
Quadratic	$Y = b_0 + (b_1 * t) + (b_2 * t^2)$	.455***	.186	-55.893
Cubic	$Y = b_0 + (b_1 * t) + (b_2 * t^2) + (b_3 * t^3)$	.480***	.188	-54.712
Logarithmic	$Y = b_0 + (b_1 * \ln(t))$	.429**	.184	-57.052
S	$Y = \exp^{(b_0 + (b_1/t))}$	.828*	.292	-40.484

\* significant at  $p < .001$ , \*\* at  $p < .01$ , \*\*\* at  $p < .05$ .

Figure 3. Plot of Transfer Traffic Recovery Rate Against Time and Regression Curves



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