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„DREAMING OF NEW YORK AND DUBAI – SHOULD SECONDARY AIRPORTS EXTEND THEIR RUNWAYS TO ATTRACT LONG HAUL FLIGHTS?"

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In Europe, intercontinental flights are concentrated at a few large hubs and some major secondary airports like Manchester or Düsseldorf. The vast majority of non-hubs, however, are hardly present in the long haul market, even though many of them possess sufficient infrastructure to handle wide body aircraft. Nevertheless, additional non-hubs intend to enlarge their runways with the intention to "go long haul".

We discuss and empirically test potential factors influencing the choice of secondary European airlines by long haul carriers, employing OLS and logistic regression analyses. Hereby, we can evaluate the relevance of runway infrastructure with regard to the long haul sector. It shows that GDP is the main driver of long haul flight supply at secondary airports, while intense competition by larger airports has a reverse impact. Airports in the UK tend to attract intercontinental air services easier than those in mainland Europe, possibly caused by high numbers of immigrants from overseas and strong relations with the U.S. A sufficient runway length is a necessary, but not a sufficient condition for intercontinental flights. The results might be of relevance for regional airport planning and could help avoid further inefficient infrastructure investments at airports with low demand.

***Keywords*:** airports, airlines, networks, hubs, long haul
JEL codes: L93, R41, R42

1. INTRODUCTION

Most long haul air traffic is concentrated at the world's leading hub airports with high rates of transfer traffic. Reasons for this are both economies of size, scope and density on the airline level and, in some markets, strict bilateral air service agreements, making it a difficult for most secondary/non-hub airports to canvass for long haul services. For this reason, most secondary airports have struggled to successfully "go long haul", despite of sufficient infrastructure supply (runway length) at many locations. In these cases, the provision of infrastructure dedicated to wide body aircraft is not economically efficient. Nevertheless, secondary airports all over Europe plan to improve their runway infrastructures beyond a level required for intra-European flights, "dreaming" of new air services to international gateways like New York or Dubai. Examples include Munster/Osnabruck or Berlin BBI in Germany, East Midlands or Birmingham in the UK and Sofia in Bulgaria. Hereinafter, we discuss and empirically test the importance of runway length and other factors with regard to long haul flight supply at secondary airports.

The paper is structured as follows: after providing an overview of the current distribution of decentralised long haul flights, we discuss potential determinants of this uneven distribution between airports. For a data sample of (virtually all) 224 secondary airports in Europe, OLS and logistic regression analyses are employed to test the relative importance of the discussed factors. It shows that, in the passenger segment, GDP is the main driver of long haul flight supply, while airport competition has a negative impact. British and Irish airports seem to attract intercontinental flights easier, which might be caused by strong ethnic and economic relations with North America. A sufficient runway length, finally, turns out to be a necessary, but not a sufficient condition for the inauguration of intercontinental services. In the all-cargo segment, airport infrastructure, proximity to a capital and GDP are the main determinants of long haul flight supply.

There has not yet been much economic research on hub-bypassing long haul air traffic, except for a game-theoretical paper of Düdden (2006). He shows that legacy carriers tend to complement pure 1-hub-networks by additional long haul flights from secondary airports if local high yield demand is large enough. In addition, Berster and Wilken (2008) illustrate and discuss the recent development of decentralised long haul air traffic in Germany.

In this paper, all air services from Europe to destinations in overseas are referred to as “long haul” and “intercontinental” flights, apart from those to countries around the Mediterranean. To exclude thousands of small airfields from the sample, we regard as secondary airports all 224 commercially used European airports that are equipped with ILS and runways of more than 2,000m, except for the large hubs Amsterdam, Paris CDG, Frankfurt, London LHR, Madrid, Munich, Rome FCO, Vienna and Zurich. However, hubs that focus completely on intra-European traffic, such as Lyon or Palma de Mallorca, are assigned to the group of secondary airports.

2. DECENTRALISED LONG HAUL FLIGHT SUPPLY IN EUROPE

Figure 1 illustrates the October 2007 distribution of available seats on long haul flights between secondary airports in Europe. London Gatwick and Manchester alone account for more than 25% of total capacity, and only 14 airports in total reach an individual market share of more than 1%.

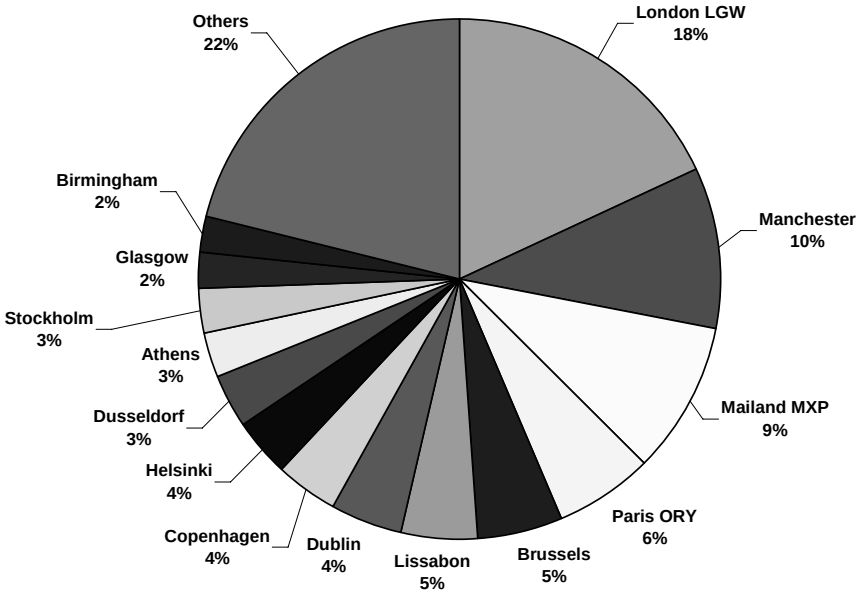

Fig. 1. October 2007 Distribution of weekly seats on long haul flights between secondary airports in Europe. Source: Own calculations based on OAG and amadeus.net timetable data and on JP airline fleets seating and capacity information. Regular charter flights not listed in OAG/amadeus.net have been compiled manually.

The observed long haul flight supply at non-hubs can be divided into the following groups:

- Scheduled flights by European legacy carriers [LEGACY]: Examples are LOT from Warsaw and Aer Lingus from Dublin, flying to key long haul gateways like New York or Chicago.

- "Long haul feeder flights" by network carriers from overseas [LHFEEDER]: Examples for this group are non-European carriers such as Delta Airlines or Emirates which fly to their hubs in overseas. As these flights "feed" the respective hubs, they are referred to as "long haul feeder flights".
- Leisure and ethnic flights [L&E]: This third group includes leisure carriers, such as LTU/Air Berlin (Germany), Corsair (France) or Monarch (UK), which fly to typical overseas holiday resorts, and ethnic carriers like PIA or Mahan Air, connecting European conurbations with high numbers of immigrants with the respective home countries.
- All-premium class services [ALLBIZ]: All-business class airlines like Privatair (operating for Lufthansa), Silverjet, EOS, Maxjet, Openskies and L'Avion offer(ed) premium class services from selected secondary airports to destinations in the USA. However, most of them have ceased operations in 2008.

Table 1 shows the importance of these market segments for different size classes of non-hubs, measured by the total number of long haul services per week. Large secondary airports with several daily long haul flights, such as Manchester or Dusseldorf, show a much more uniform distribution of the respective groups than airports handling only a few, mostly leisure, long haul services.

Table 1

Importance of different market segments for different size groups of secondary airports in Europe

Segment	**Classes of secondary airports according to the total number of weekly long haul flights**		
	< 7 **n = 53**	**7-50** **n = 27**	**> 50** **n = 13**
LEGACY	9%	18%	30%
L&E	80%	27%	35%
LHFEEDER	11%	51%	34%
ALLBIZ	0%	4%	1%

Source: Own calculations based on OAG and amadeus.net timetables and JP airline fleets seating and capacity information. Regular charter flights not listed in OAG/amadeus.net have been compiled manually.

3. IMPLICATIONS FOR AIRPORT INFRASTRUCTURE EFFICIENCY

The current distribution of long haul flights means that, at many non-hubs, wide body dedicated airport infrastructure is provided at a more than sufficient level: Except for operations from a few airports located at high altitude, a runway length of 2,700m is usually enough for most continental flights, complying to safety regulations. Consequently, we refer to those sections of runways that exceed a total length of 2,700m as "long haul specific" infrastructure. Currently, 115 secondary European airports are equipped with long haul specific infrastructure. Calculations indicate that, even assuming a very moderate construction price of 400 EUR/m², an asset depreciation range of 30 years, an interest rate of 5% and very optimistic airport revenues of 20 EUR per long haul seat, only a maximum of 41 of these 115 airports would generate enough revenues from long haul services to independently finance their long haul specific infrastructure. This gives a rough idea of the dimension of long haul runway misallocation. Examples of airports whose long haul specific revenues have continued to be low for years, despite of the provision of long runways, include Hanover in Lower Saxony/Germany (3,800m runway) and Sevilla in Spain (3,360m), among many others.

4. DETERMINANTS OF LONG HAUL FLIGHT SUPPLY AT NON-HUBS

4.1 Compatibility of decentralised long haul air traffic and idealtypical airline business models

Airport choice has been widely discussed in the literature (see for example Blackstone et al., 2006), but there has hardly been any particular focus on decentralised long haul flights. In the following, we briefly discuss in how far long haul operations to secondary airports are consistent with the business models of idealtypical groups of airlines. Based on this, potential factors on long haul flight supply at secondary airports are discussed and empirically tested. A distinction between internal, semi-external and external factors is drawn to account for the degree in how far airport management can independently control the respective factors.

The main types of passenger airlines operating long haul are legacy, leisure or ethnic carriers. Legacy carriers rely on the hub and spoke model which offers advantages both on the cost (economies of scale, scope and density, see Caves et al., 1984, or Hansen and Kanafani, 1989) and demand side. In offering connections at the hub, the hub airline provides a large variety of connections to choose from, including niche routes which could never be served directly due to poor point to point demand (for a detailed analysis of hub and spoke networks, see Bailey et al., 1986, and Hansen and Kanafani, 1989). Every additional service from and to a hub

yields in a multiple of new O&Ds and thus in additional demand and higher economies of density. Consequently, it often might not make good economic sense for hub carriers to decentralise traffic. Legacy carriers from overseas, however, are more likely to serve secondary European airports (by long haul feeder flights), as their hubs are located at the other end of the route. Leisure (and ethnic) carriers have been going long haul flights for decades, selling parts of their capacities to tour operators. They achieve low unit costs in focusing on direct point to point flights using aircraft with high-density seating. A temporal demand concentration on few flights per week is usually accepted by holidaymakers who prefer to stay abroad for a minimum of one week. The same applies to ethnic carriers (Brons et al., 2002, Windle and Dresner, 1995). The range of economically viable long haul destinations suitable for leisure and ethnic carriers, however, is rather limited. Low cost carriers (LCC), finally, achieve very low costs in focusing on simple point to point flights and in eliminating frills. They offer mainly short haul routes between relatively small and uncongested airports where fast turnaround times are ensured and thereby manage to extend fleet utilization. Airlines like AirAsia X and defunct Oasis HongKong show that some investors and other stakeholders believe in the transferability of the low cost business model to long haul operations. However, we question this as some key elements of the strategy of LCC either cannot be implemented on long hauls, or are of relatively less importance due to cost structure differences (Ionides, 2006).

4.2 Internal factors: Airport marketing

As a response to increasing competition, most airports have intensified their marketing activities. However, unlike other industries, airports cannot independently control all 4 P's of the marketing mix (product, price, promotion, place). Instead, decisions on crucial product characteristics such as runway length, terminal size or curfew are usually subject to governmental and jurisdictional approval, and size and attractiveness of the catchment area (dimension "place") are fully exogenous. Since promotion is supposed to have only marginal impact on the attraction of long haul services, pricing is the only airport marketing mix dimension which could be actively used to attract long haul carriers. The success of smaller airports in attracting low cost carriers by offering reduced airport fees indicates how price sensitive some airlines are (Barrett, 2004, Gillen and Lall, 2004, and Morrison and Mason, 2006). On long haul routes, however, airport charges represent only a friction of total operating costs, making it unlikely that low landing and handling costs alone would help attract long haul services.

4.3 Semi-external factors

Long haul services tend to require a more sophisticated airport infrastructure than aircraft flying on continental routes. The minimum runway length required for a specific take-off depends on various factors such as aircraft type, engines, take-off weight, humidity, runway altitude above sea level, weather and pavement surface. A runway length of 3,400 m is generally sufficient for most long haul operations. On shorter runways operations might be subject to payload restrictions which reduce profitability. Since extensions of airport capacities usually hinge on public approval, airport infrastructure is regarded as a semi-external factor. The same applies to operating restrictions. Night flight bans, for example, negatively affect the attractiveness of an airport especially for the air cargo industry.

4.4 External factors

Sufficient local demand is supposed to be a necessary condition for direct intercontinental flights from non-hub airports. The following factors describe the attractiveness of airport regions: number and clustering of inhabitants and immigrants from overseas, economic power (GDP), industry structure and importance as a destination for business travellers or tourists (Brons at al., 2002, Janic, 2006, and Pagliari, 2005). A good connectivity to other modes of transport enlarges airport regions and might thus reduce access costs and further enhance the attractiveness for long haul carriers (Weisbrod at al., 1993, and Windle and Dresner, 1995, among others, confirm the importance of access time). Additionally, secondary airports could benefit from capacity constraints at nearby hubs like Frankfurt or London Heathrow, as slot shortage could force new and independent long haul carriers to look for alternatives. In contrast, close proximity to larger airports and thus increased competition might reduce a secondary airport's potential in the long haul market. Restrictive bilateral air service agreements (ASA's), eventually, could also hamper the development of long haul services at non-hubs. While restrictive bilaterals usually allow the (former) national carriers only to operate scheduled services, so-called "open sky" agreements permit all airlines based in the signing countries to freely select landing points, routes, prices and frequencies (Gillen et al., 2001, pp. 31-32). By now, only the aviation markets within Europe and between Europe and the US and some Asian countries have become highly liberalised. Thus, further liberalization of ASA's would facilitate the attraction of new long haul services by non-hubs (Gillen et al., 2001, pp.185-187, Haworth, 1996, p.68). Table 2 summarizes the factors identified and discussed above.

Table 2

Classification of potential factors on long haul flight supply

Airport-related factors (Marketing Mix)				Non airport-related factors	Degree of external influence
Price	**Promotion**	**Product**	**Place**		
Airport charges, Incentives (discounts, rebates)	**Public relations, Market research, Airline marketing**	**Landside infrastructure**			**Low**
		Airside infrastructure, Operational restrictions			**Medium**
			Catchment area, Ground access	**Airport competition, Bilaterals**	**high**

4.5 Empirical findings

4.5.1 Variable determination and quantification

Multiple OLS regression analysis is used to test the dependence of the output "long haul flight supply at secondary airports" from one or more independent variables. In the passenger segment, we define cumulated weekly MTOW on long haul services ***[MTOWWK]*** as output variable to implicitly consider not only seats but also belly cargo capacity. The analysis is conducted for all long haul services from all 224 secondary European airports in a typical week in October 2007. In contrast to timetable analyses purely based on OAG data, our data set has been manually complemented by long haul charter services, for instance from Scandinavia and the UK to Thailand or the Caribbean. The independent variables included in the estimations are quantified as follows:

Internal Factors (Airport Marketing)

The degree of market research and other marketing activities of an airport is not measurable and thus not included in our estimations. Rebates and discounts are not published in many cases, making it difficult to create a price indicator. However, it is likely that those airports which are characterized by a high percentage of low cost traffic will also offer discounts to long haul carriers. Thus, we employ a dummy variable ***[LCAIRPORT]*** for airports with a low cost traffic market share exceeding 50%.

Semi-external factors

The variable ***[RWY***] describes the physical runway length (in metres) of an airport and is used as a proxy for the infrastructural configuration with regard to the needs of long haul services. Additional estimations modelling runway strength have not led to substantially different results, as most long runways seem to be relatively stable. To account for operational restrictions, the dummy variable ***[NIGHT]*** takes the value of 1 if an airport operates 24/7. Other operational restrictions, such as limits on hourly, daily or annual aircraft movements, are hardly measurable.

External and other factors

The following variables are employed to describe various aspects of airport catchment areas, being defined as all NUTS 2 regions whose largest city is accessible within 60 minutes. In some countries with geographically very large NUTS 2 regions, however, such as Spain and Finland, NUTS 3 regions are used to avoid overestimations. The level of economic activity in an airport region can be measured by GDP. GDP data in EUR for the year 2004 are sourced from Eurostat ***[GDP04]***. In addition, the GBI-Index developed by the Globalization and World Cities (GaWC) Study Group is employed as industry structure variable, mirroring the number of global service companies and their branch offices located in the airport region ***[GBI]***. The variable ***[BEDS]*** and the dummy variable ***[CAPITAL]*** are included in our estimations to consider the touristic (proxied by the number of hotel beds) and political importance of the catchment area in the year 2006. Two other dummy variables incorporated in the estimations are ***[COMP]*** and ***[HUBCAP]***. [COMP] describes the degree of airport competition and takes the value of 1 if a larger airport is located less than 60 minutes away, and [HUBCAP] describes the degree of congestion at the national hub [1 = congestion, 0 = idle capacity available throughout the day]. Finally, country dummy variables ([UK] for UK and Ireland, [SPAIN], …) are employed to account for other country-specific factors.

Finally, the variable **[PAX06]** is used in some estimations to describe total passenger numbers at the airport in question in the year 2006. The degree in how far bilaterals are liberalised is not directly quantifiable and thus not directly incorporated in the estimations.

4.5.2 Discussion of the results

Double log regression models have led to better results than non logarithmic estimates. Table 3 shows the regression results for models A (including PAX06 and GBI) and B (not including

PAX06 and industry structure variable GBI). In both models, COMP, UK and LNRWY turn out to have a significant impact on long haul flight supply. If PAX06 is included in the estimation, it is highly significant, along with SPAIN and GBI. If PAX06 is not included, LNGDP and CAPITAL have a significant influence on long haul flight supply. Not surprisingly, GBI and LNGDP are highly correlated.

Table 3

Impact of the discussed variables on long haul flight supply in the passenger segment (MTOW/week)

Model	**A**		**B**	
N	**224 (all secondary airports)**		**224 (all secondary airports)**	
R^2 / R^2 adj.	**0.636 / 0.626**		**0.551 / 0.541**	
F-Value	**63.103**		**53.612**	
Coefficients	**B**	**Beta**	**B**	**Beta**
(constant)	-53.458***		-53.798***	
LNPAX06	0.801***	0.390	n.i.	
SPAIN	-1.954***	-0.176	n.s.	
COMP	-0.952***	-0.113	-1.901***	-0.225
UK	3.299***	0.281	4.194***	0.357
LNRWY	5.596***	0.263	6.034***	0.284
LNGBI	0.403***	0.219	n.i.	
LNGDP	n.s.		0.815***	0.342
CAPITAL	n.s.		2.849***	0.274
Dependent variable: LNMTOWWK, n.s.: not significant at the 5% level, n.i.: not included in the estimation *)/**)/***) significant at the 10% / 5% / 1% level				

The results indicate that a strong catchment has a positive impact on the number of long haul flights. If PAX06 is included in the estimation, it does (not surprisingly) turn out to be highly significant, as large airports are usually located in economically viable areas. At the same time, the coefficient for SPAIN takes a negative value, as most airports in Spanish holiday regions handle virtually no long haul flights despite of high passenger figures. In contrast, British and Irish airports seem to attract intercontinental services relatively easy. This can be explained by the high number of immigrants from overseas living in the UK and in Ireland, and by strong social and economical relations with North America. Runway length has a positive impact because longer runways enhance an airport's technical capability of handling wide body aircraft. However, figure 2 shows that runway length is only a sine qua non: a good runway alone does not automatically yield in a good number of long haul flights.

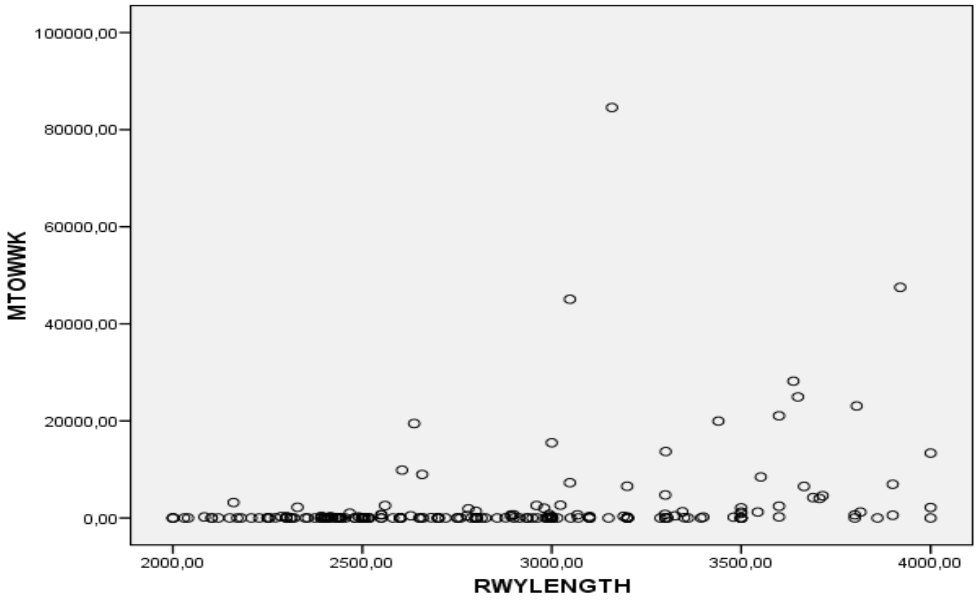

Fig. 2. Correlation between runway length at secondary airports and long haul flight supply (in total weekly MTOW) in 2007

Looking at all-cargo air traffic, it is difficult to employ a metric output variable as complete and reliable timetable data for the cargo segment are unavailable. Instead, we use a logistic regression model to identify those factors that have an impact on the binary output variable ***[CARGO]*** which takes the value of "1" if an airport handles long haul all-cargo flights at least irregularly. Information on websites run by aviation enthusiasts, as well as additional information by shippers, airports and cargo airlines helped us find out which 70 airports belong to this group.

Table 4

Factors on long haul cargo flight supply at secondary airports

Model	**LOGCARGO**	
Dependent Variable	**CARGO (MTOW/week)**	
N	**224**	
McFadden-R²	**0.40**	
Chi-Quadrat	**111.304*** **	
Hosmer-Lemeshow statistic	**0.846**	
Percentage better predicted by logistic regression	**68.6% / 85.7%**	
Estimation results	**B**	**Exp(B)**
(constant)	-11.707***	0,000
RWYLENGTH	0.003***	1.003
CAPITAL	1.518***	4.565
GDP04 (in BIO EUR / 90 MIN)	0.006***	1.006
GDP04 (in BIO EUR / 90MIN) = GDP in Billion EUR in the 90 minutes catchment area *)/**)/***) significant at the 10% / 5% / 1% level		

The results shown in table 4 indicate that the factors runway length, capital and GDP within the 90 minutes catchment area have a significant impact on long haul cargo flight supply at secondary airports. This comes not surprisingly as time constraints require air cargo shipments to arrive in populated (and economically viable) regions and not in remote areas. Usually, these regions are not too far away from the respective capitals. Runway length is more crucial for cargo than for passenger flights as most long haul cargo aircraft are large wide body aircraft. Surprisingly, night flight allowance does not turn out to have a significant influence, but at least all larger cargo airports have no night flight ban.

5. CONCLUSION

In this paper, factors that might influence long haul flight supply at European non-hubs were discussed and empirically tested. The economic power in an airport's catchment area seems to heavily and positively influence long haul flight supply, while competition by larger airports counteracts. Long runways alone are not enough to boost long haul flights. As a consequence, dozens of airports do not gain enough revenues (if any) from long haul services to finance their long haul specific infrastructures. To avoid further misallocation, the provision of long haul specific infrastructure should only be targeted at airports in economically viable and densely populated regions.

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