Determinants of longhaul flight viability from secondary airports the implications for airport planning and management

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Abstract

Most long-haul air traffic from and to Europe is concentrated on a couple of hubs with a high rate of transfer traffic. In contrast, at secondary airports, the situation is different. While there are a few non-hubs such as Manchester or Barcelona with a relatively large number of direct intercontinental flights, the vast majority of smaller airports hardly ever receive any long-haul flights, although many of them provide longhaul-compatible infrastructures. This paper describes a current research project conducted by the Institute of Transport Economics at the University of Muenster, in we analyse the factors influencing airport choice for intercontinental flights from non-hubs in Europe. A multiple cross-sectional regression analysis will be applied to test the relative importance of various factors that might influence the choice of non-hubs by long-haul carriers. As the project is still work in progress, this paper mainly is a description of the study's approach but also gives some preliminary results which are based on a small data sample containing all German non-hubs. The results of the final study are to provide airport planners and policy makers with a prognostic model to establish how the number of long-haul flights could be boosted.

***Keywords*:** airports, airlines, networks, hubs, long-haul

JEL codes: L93, R41, R42

Contents

Abbreviations

GDP	Gross domestic product
C	Cargo
FRA	Frankfurt airport
LH	Longhaul flights
LHR	Flughafen London-Heathrow
Pax	Passenger
PCN	Pavement Classification Number
RWY	Runway
WLU	Work Load Unit(s)

Tables

1 Introduction

Most long-haul air traffic from and to Europe is concentrated on a couple of hubs with a high rate of transfer traffic. In contrast, at secondary or non-hub airports, the situation is different. While there are a few non-hubs such as Manchester or Barcelona with a relatively large number of direct intercontinental flights, the vast majority of smaller airports hardly ever receive any long-haul flights. Although many of these airports provide adequate infrastructure for wide-body aircraft, most of them are not successful in attracting long-haul carriers.

Thus, at many European non-hubs, the provision of infrastructure dedicated for long-haul flights is not economically efficient. A reason for resource misallocation is that the determinants of the number of intercontinental flights at non-hubs are not considered in sufficient detail by policy making bodies and other institutions which decide on the construction and extension of airports. The airports in question can be divided into two groups:

- At some secondary airports, e.g. Leipzig/Halle, the effects of investment in long-haul infrastructure have been overestimated. Despite the provision of a high quality infrastructure, only a few intercontinental flights are handled each month. Thus, the utilization rate of dedicated capacity for wide-body, long-haul aircraft is extremely low.
- At other airports, the demand for long-haul flights cannot be met, because the necessary infrastructure investment is not made due to political or environmental restrictions. Düsseldorf is a good example of an airport that would possibly welcome even more long-haul flights, if the necessary extension of its airport runway was undertaken.

This paper describes a current research project conducted by the Institute of Transport Economics at the University of Muenster, in we analyse the factors influencing airport choice for intercontinental flights from non-hubs in Europe. The results are to provide airport planners and policy makers with a prognostic model to establish how the number of long-haul flights could be boosted.

In our study, we will conduct a multiple cross-sectional regression analysis to test the relative importance of various factors that might influence the choice of non-hubs by long-haul carriers. As the project is still work in progress, this paper mainly is a description of the study's approach but also gives some preliminary results which are based on a small data sample containing all German non-hubs equipped with an infrastructure capable of handling wide-body aircraft on long-haul flights at least under restrictions. As soon as all necessary data is available, our sample will be extended by all other EU secondary airports. In addition, a panel analysis might be conducted at a later stage of the study to further extend the data sample and to eliminate temporary changes caused by one-off events such as avian influenza or 9/11.

The factors which could potentially influence the supply of long-haul flights at secondary airports are derived from the economic literature on airline networks and airline business models. While some factors are endogenous, such as the airport infrastructure itself, or marketing activities by the airport authorities, others are exogenous like population, GDP and industry structure in the catchment area or proximity to the nearest hub and its capacity constraints.

2 Definitions

2.1 Longhaul flights

There is no coherent definition of what is a longhaul or intercontinental flight.[1] While Porger defines every flight of more than 2.000 km as a long distance trip[2], in this work – following the differentiation of Lufthansa[3] – all flights from Europe to other continents except for those located around the Mediterranean will be regarded as intercontinental flights. Table 1 shows all these destinations.

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1 These two terns will be used synonymously.

2 See Porger (1978), p. 107.

3 See Maurer (2001), p. 10.

Table 1: Longhaul destinations from Europe

Region	Countries
Africa	all countries except for Northern Africa (Algeria, Egypt, Libya, Marocco, Tunisia)
Asia / Australia / Pacific	all countries except for those located around the Mediterranean (Asian part of Turkey, Israel, Lebanon, Syria) and Jordan, but incl. east Uralian Russia
Amerika	all countries

2.2 Secondary airports

As the literature contains many different classifications of airports[4], there is no coherent definition of a secondary airport.

In this study, all airports that do not serve as a connecting point (hub) between longhaul and short-haul flights belong to the group of secondary airports. Since there also is no general definition of what is a hub, we regard all airports as hubs that fulfil at least 4 of the 5 hub criteria shown in table 2 which have been discussed and employed in various articles in the literature.[5] All other airports are secondary airports and thus included in our study.

4 Many different approaches of airport classifications can be found in the literature: The International Civil Aviation Organization (ICAO) uses a classification which refers to the technical capability of an airport to handle certain aircraft types (see Airports Authority of India (2005)). Other institutions such as Airports Council International (ACI) or the European Union simply classify airports according to their output, that means passenger and cargo figures, irrespective of the character of the flights handled (ACI (2005) and EU Commission (2005)), while BCG considers the airports' function in the global aviation market (BCG (2004)).

Table 2: Hub criteria

Transfer rate > 20 %
Passenger numbers > 10 Mio.
Waves
Main airport of the national carrier
No focus on continental traffic only

What is more, secondary airports which are part of this study must have an infrastructure that allows them to handle longhaul aircraft at least with restrictions. This exclusion is to avoid that hundreds of smaller airfields are included in the sample. Thus, we only include airports with a runway length of at least 2000 m and a PCN (Pavement Classification Number) of 60[6] or higher. These values can be regarded as rough minima allowing for at least restricted longhaul operations.

As we do not yet have data for airports outside Germany, the preliminary analysis in this paper focuses on the German secondary airports shown in Table 3. Frankfurt and Munich fulfill at least 4 of the hub criteria shown above and are therefore excluded from the sample. Friedrichshafen, Karlsruhe, Lübeck and Paderborn are excluded because there is no availability of adequate data.

Table 3: Sample of secondary airports (N=17)

Berlin-Schönefeld, Berlin-Tegel, Berlin-Tempelhof, Bremen, Dortmund, Dresden, Düsseldorf, Erfurt, Hahn, Hamburg, Hannover, Köln/Bonn, Leipzig/Halle, Münster/Osnabrück, Nürnberg, Saarbrücken, Stuttgart

5 For hub definitions and hub criteria see Burghouwt/de Wit (2005), for whom a hub must be characterized by a high number of connections and by in- and outgoing flights operated in waves, or Roth (2002) who regards those airports as hubs that are dominated by one single carrier.

6 The PCN value indicates the strength of a runway. Widebody aircraft used on longhaul flights require a PCN of at least 60. See Malina (2005).

3 Determinants of the number of longhaul flights at secondary airports

3.1 Identification of factors on longhaul flights

Airport choice by airlines has been widely discussed in the literature, but there has hardly ever been a focus on longhaul flights. In our study, potential factors on the supply of longhaul flights at secondary airports are discussed, quantified and finally empirically tested. A distinction between internal, semi-external and external factors is undertaken to show those factors which could at least partly be influenced by airport managers or governmental bodies and those factors which are completely external.

3.1.1 Internal factors: Airport marketing

In times of increasing deregulation and competition – also between airports – an active airport marketing could be an important factor on the attraction of new air services. Pricing strategies and especially price discrimination as a method to attract price sensitive low cost carriers are currently widely discussed. Although, for longhaul carriers, airport charges ceteris paribus are a relatively small part of the total operating cost compared to shorthaul carriers, competitive airport fees, volume based discounts and financial support could possibly help attracting new longhaul services. [7]

3.1.2 Semi-external factors

3.1.2.1 Airport infrastructure

As mentioned above, longhaul aircraft require a better airport infrastructure than short- and medium-haul aircraft. Of highest importance is a sufficient length and strength of the runways. The minimum runway length an aircraft requires depends of various factors such as take off weight, humidity, altitude above sea level, weather and pavement surface of the runway. A runway length of at least 3400 m is generally sufficient for all aircraft and MTOW's. If the runway is shorter, the flight might only depart under payload restrictions which reduce profitability. Apart from the

runway length, the strength is important because widebody aircraft usually require a more concrete runway than smaller aircraft. This stability is expressed in the so-called pavement classification number (PCN) of a runway. A PCN of 60 can be seen as the absolute minimum for longhaul-suitable aircraft.[8]

Since extensions of airport capacities usually depend on positive decisions of the local politicians and courts, airport infrastructure can be regarded as a semi-external factor.[9]

3.1.2.2 Operational restrictions

For this reason, possible operating restrictions are another semi-external factor. Bans of night flights negatively affect the attractiveness of an airport especially for cargo airlines und thus also for longhaul flights.[10]

3.1.2.3 Intermodal connectivity

Since a good connectivity to other modes of transport, i.e. motorways and long distance trains, enlarges an airport's catchment area and reduces the airport users' access costs, it might make an airport more attractive for longhaul carriers.[11]

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7 See Knibb (1993). Graham (2003) provides a good overview of the structure of aeronautical charges and explains how discounts can be used to attract new services.

8 See Malina (2005).

9 In Germany, for example, it can take more than 20 years to built a new runway. For a detailed analysis of the problems connected with the extension of airports, see Bickenbach/Kumkar/Sichelschmidt et al. (2005).

10 Facing a night ban at Frankfurt Airport following the construction of a fourth runway, Lufthansa Cargo (2006) has stressed the importance of night flights for the cargo industry.

11 There are many articles focusing on the importance of airport accessability. In an early paper focusing on the New York – New Jersey area, Augustinus (1974) showed that airport choice depends on ground access time. Later studies conducted by Weisbrod/Reed/Neuwirth (1993) or Windle/Dresner (1995) confirm the importance of access time.

3.1.3 External factors

3.1.3.1 Local demand

While in hub-and-spoke networks[12], the demand from various origins is canalized at the transfer hub, a sufficient local demand is a condition for an airline to start direct longhaul passenger or freight services from a secondary, non-hub airport.

Based on the literature, the following, exogenous factors describe the attractiveness of the catchment area of an airport and thus influence the viability of longhaul flights from this airport: number of inhabitants, economic power, industry structure, political importance, attractiveness as a destination for incoming passengers, number of people belonging to ethnic minorities with relations to other continents.[13]

3.1.3.2 Distance to the nearest hub and its capacity constraints

Today, most longhaul air traffic is operated within hub-and-spoke networks. The reasons for the dominance of this network model are its cost and strategy related advantages over other forms of networks. These advantages have been widely discussed and empirically observed. On the cost side, airlines operating hub-and-spoke networks can realize significant economies of scale, scope and density. On the marketing or strategy side, hub-and-spoke-networks allow the hub carrier to have a dominant position at its hub(s) which can result in charging higher fares and in the ability to deter entrance of other carriers.[14]

Today, high infrastructure utilization during the waves of incoming and departing flights are the main problems of hubs and thus the main disadvantage of hub and spoke networks. Movements

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12 For a detailed analysis of the function of hub-and-spoke-networks, see Bailey/Graham/Kaplan (1986) or Hanlon (1996).

13 See for example Ash/Trent/Ewald (1990), Brons/Pels/Njikamp (2002), Doganis (2002), Bonné (2003), Derudder/Witlox (2005), Hanlon (1996), Janic (2006) and Pagliari (2005).

14 The advantages of hub-and-spoke networks are discussed by authors like Bailey/Graham/Kaplan (1985), Hansen/Kanafani (1989), Borenstein (1991), Dresner/Windle (1992) and Button (2002).

at European hubs like Frankfurt or London have long surpassed the capacity at these airports.[15] Theoretically, these developments could boost longhaul flights from smaller airports which currently have idle capacities.[16] According to Ewald, especially new and independent longhaul carriers would have to make use of secondary airports because they do not possess enough slots at the major hubs.[17] For these reasons, the distance to the nearest hub and its capacity situation are supposed to be important factors on longhaul flights from secondary airports.

3.1.3.3 Developments in the airline sector

It is likely that the number of longhaul flights at a secondary airport also depends of the market structure in the (regional) airline market. According to Beyhoff/Ehmer/Wilken, the increasing formation of global airline alliances has led to additional feeder flights to the partner airlines' hubs and at the same time to a decrease of direct longhaul flights from secondary airports.[18] In establishing these multi-hub networks, the alliances' members try to benefit even more of the advantages of hubbing.

Also, as discussed above, direct longhaul flights from non-hubs require sufficient demand and thus attractive catchment areas at both ends of the route. In addition to local passengers, transfer passengers can make these flights more viable as they might help the carrier to reach the load factor critical to break even.[19] To generate transfer passengers at a non-hub like Düsseldorf, the longhaul airline operating from there has to find independent short-haul carriers to co-operate with. This will be a difficult task if – like nowadays – many of the airlines which offer possible connecting flights belong to other alliances or are low cost carriers that per se do not sign inter-

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15 In the end of the 1990ies, on working days, the demand for slots at Frankfurt airport had already reached a level of more than 110 movements per hour. Between 7:30 and 21:30, it was constantly higher than the airport's capacity of 80 movements per hour. See Bundesregierung (2000), p. 36. Up to now, the supply has slightly increased to 82 movements per hour, but the demand is supposed to have risen even faster causing severe peak load problems.

16 See Seebohm (1999), p. 10.

17 See Ewald (1990), pp. 61-62. Slots are allocated in a system based on grandfather rights, that means an airline can use a slot as long as it uses it regularly which makes it nearly impossible for "new" airlines to access a congested hub. For more information on slot allocation, see Graham (2003).

18 See Beyhoff/Ehmer/Wilken (1995), p. 52.

line agreements. An example of an independent carrier which feeders longhaul services from a secondary airport is dba, the former subsidiary of British Airways, which offers connecting flights to LTU's leisure longhaul operations from Düsseldorf and Munich.[20]

3.1.3.4 Bilateral Air Service Agreements

In bilateral air service agreements (ASA's), governments rule which and how many airlines are allowed to offer how many flights between how many airports in the respective countries. While restrictive ASA's only allow the (former) national carriers to operate scheduled services (from their hubs), so called "Open Sky" agreements allow all airlines of the respective countries involved to fly as often as they want – and from whatever airport they like.[21] Today, though, only the aviation markets within Europe and between Europe and the US are highly liberalised, while flights from Europe to most other longhaul destinations are still relatively restricted; direct flights in these regions from secondary airports thus are usually prohibited. Thus, a further liberalization of the ASA's is supposed to make it easier for secondary airports to attract new longhaul services.[22] A study conducted for the airport of Hamburg has shown this for flights to Asia.[23] Since the degree of liberalization of a country's ASA's is not influencable by an airport operator, it can be regarded as an external factor on longhaul flights.

3.2 Empirical test of the discussed factors

3.2.1 Determination and quantification of input and output variables

The multiple regression analysis can be used for the analysis of the dependence of one dependent variable (output variable) from one two or more independent variables (input variables). The

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19 See Ash/Trend/Ewald (1990), p. 3.

20 See LTU's current summer 2006 timetable.

21 See Gillen et al. (2001), pp. 31-32.

22 See Haworth (1996), p. 68 and Seebohm (1999), p. 13.

23 See Gillen et al. (2001), p. 185-187.

analysis is conducted for the year 2004, but other years will also be considered in the final version of our study.

Output variable

In our study, we plan to test the dependence of the degree of longhaul flights at secondary airports from the input variables discussed above. Thus, an output variable has to be defined which describes well the degree of longhaul flights at non-hub airports.

As air transport delivers two seperate outputs, i.e. passengers and cargo[24], our output variable should both consider all passengers on longhaul flights and all intercontinental cargo shipments. An indicator which fulfils these requirements is the "Work Load Unit" (short WLU). One WLU is defined as either one passenger or 100 kg of cargo.[25] Thus in the following, the output variable ***„Work Load Units handled on intercontinental direct flights"*** (WLU_IK) is used. For Germany, the Federal statistical office (Statistisches Bundesamt) separately reports the numbers of passengers and tonnage of cargo transported from all major German airports to all destinations. Other European non-hubs can not yet be covered in this paper because we have not yet received all necessary data.

For an additional analysis in which passenger and cargo traffic are covered separately, the output variables „Passengers on direct longhaul flights " (WLU_IK_PAX) and „Cargo tonnage on direct longhaul flights" (WLU_IK_C) will be used.

Input variables

Above, possible factors which might influence the number of longhaul flights from secondary airports have been derived from literature and discussed. In the following analysis, we want to test if these factors really have an significant influence on longhaul flight supply at German non-

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24 Mail services are not considered because we do not know of any longhaul mail-only services from Europe.

25 See Nyshadham/Rao (2000), p. 113

hub airports. Thus, it is necessary to quantify the input variables. Table 4 shows the indicators used to describe the factors.

Table 4: Determinants of the supply of longhaul flights

Factor		Variable
Internal	**Marketing Mix Measures**	
	Market research department and active airline marketing	Dummy-Variable (0=no active market research and airline marketing; 1= active market research and airline marketing)
	Pricing	Landing and handling fees (€/t) for longhaul aircraft
		Financial marketing support for new flights
Semi-External	**Airport Infrastructure**	
	Number of runways	Number of runways
	Length and strength of the longest run-way	Physical length (in metres) or Dummy („not suitable for longhaul flights, suitable for longhaul flights under restrictions; suitable for all longhaul flights) (*)
	Operational restrictions	
	Night ban	Dummy (0=no; 1=yes)
	Limit of movements	Dummy (0=no; 1=yes)
	Intermodal connectivity	
	Motorway / Long Distance Train Station	Dummy (0=no; 1=yes)
External	**Catchment area**	
	Size of the catchment area	number of inhabitants for whom the respective airport is the nearest one (**)
	Economic power in the catchment area	GDP/head in the NUTS 3 area in which the airport is located (***)
	Industry structure	Number of local companies of global importance
	Political importance of the catchment area	Dummy (0=no; 1=regional capital, 2=capital)
	Attractiveness of the catchment area for incoming passengers	Number of hotel beds in the catchment area
	Ethnic minorities	Number of foreigners with origin from non-European countries (****)
	Distance to the nearest hub	Kilometers (on motorways)
	Capacity situation at the nearest hub	Dummy (0=idle capacity available; 1=congestion)
	Airline market	Availability of an independent carrier which can provide interline connections; Dummy (0=no; 1=yes)
	Bilaterals	Number of Open-Sky-Agreements with other countries

At the first, the analysis is conducted for the factors which are supposed to have the highest influence on the supply of longhaul services only. Input variables for which the necessary data is not yet available are not included at this time. In table 4, all the factors used for our analysis are marked with a grey background. Apart from this, the following restrictions presently occur but will most likely be removed in the final version of the study:

(*) The physical length (in metres) of the airport runway is one of the input variables. This implicates that each marginal enlargement of the runway would lead to a marginal increase in the supply of longhaul flights which is not practicable. Thus, in the forthcoming work, a dummy variable will thus be used for different categories of runway qualities which consider both the length and the strenghth: „longhaul flights only possible with major restrictions“, „longhaul flights possible with restrictions“ and „airport fully longhaul compatible“. The exact boundaries between these classes will be discussed at a later stage, considering the operating manuals of the most common longhaul aircraft.

(**) The exact definition of what is a catchment area has been widely discussed. At present, the only data we have access to is the number of inhabitants for whom the respective airport is he nearest one. This unrealistically implies that the inhabitants of Bochum, for instance, are completely allocated to Dortmund airport and not to Düsseldorf which is slightly further away, although the latter in reality is used more frequently by the Bochumers. In the final versions of the study, thus, a more realistic definition of a catchment area has to be used. For example, a catchment area of an airport might include all resedents who can reach an airport within a certain amount of time.

(***) After the catchment area of our sample airports is defined, the average GDP per head generated in the catchment area has to be used as an indicator. Since at present there is no adequate definition of a catchment area, we will – in this paper – use the average GDP/head of the NUTS 3 region in which the airport is located.

(****) Although the input variable „Number of ethnic minorities with relations to non-European regions“ are supposed to have a significant influence on the supply of longhaul flights, it is not included in the analysis at this time because we have not yet received the relevant data.

3.2.2 Discussion of the results

The significance of the identified variables will be analysed using the multiple regression analysis. Due to the lack of necessary data, the sample currently only contains 17 German non-hubs only (N=17), as listed in table 3.

A first analysis (Table 5) of the impact of all factors chosen above shows that nearly all variables are not significant at the 10% level. What is more, the coefficients for the variables “landing fee” (Landing_fee), “runway length” (RWYlength), “distance to the nearest hub” (Hub_Distance) and “catchment area” (CATCHMENT) do not have the expected sign.

Table 5: Impact of the discussed variables on longhaul WLU’s at 17 German non-hubs

Regression Statistics

Multiple R	R Square	Adjusted R Square	Standard Error
,947	,897	,725	289659,23

ANOVA

	SS	df	MS	F	Significance F
Regression	4374459536232,614	10	437445953623,261	5,214	,028(a)
Residual	503414841633,271	6	83902473605,545		
Total	4877874377865,880	16			

Coefficients

	Coefficients	Standard Errorr	T	P Value
(constant)	235586,993	905906,092	,260	,804
Landing_fee	11526,073	62428,449	,185	,860
NO_RWY	618997,341	240694,256	2,572	,042
RWYlength	-174,251	197,742	-,881	,412
PCN_Dummy	-49666,917	561297,382	-,088	,932
Hub_Capacity	39758,297	255006,832	,156	,881
Hub_Distance	-3108,544	1091,712	-2,847	,029
Capital	331007,070	172106,308	1,923	,103
BIP_CATCHMENT	10186,843	13875,851	,734	,491
CATCHMENT	-,016	,054	-,293	,780
night_ban	-206745,050	325936,874	-,634	,549

The adjusted coefficient of determination (R^2adj) is smaller than the coefficient of determination which underlines the insignificance of some of the factors. Apart from the small sample, a reason for these results might be that for some of the input variables the appropriate data has not been used (see above).

If the only variables used are runway length, GDP/head and the capacity situation at the nearest hub (table 6), the coefficient of determination is lower (R^2 = 0,521), but the variables "GDP/head" and "hub utilization" are significant at the 5% level.

Table 6: Impact of the variables "runway length", "GDP/head" in the catchment area and "congestion at the nearest hub" on longhaul WLU's

Regression Statistics

Multiple R	R Square	Adjusted R Square	Standard Error
,721	,521	,410	424153,84960

ANOVA

	SS	df	MS	F	Significance F
Regression	2539090032126,772	3	846363344042,257	4,704	,020(a)
Residual	2338784345739,114	13	179906488133,778		
Total	4877874377865,880	16			

Coefficients

	Coefficients	Standard Error	T	P Value
(Konstante)	-1540487,858	522605,371	-2,948	,011
RWYlength	194,452	169,465	1,147	,272
BIP_CATCHMENT	26120,459	9765,818	2,675	,019
Hub_Capacity	563839,239	244712,965	2,304	,038

When the input variables are changed, the significance of the variables fluctuates. This can mean that irrelevant variables have been used, or that the variables were not correctly defined and quantified. Another reason might be multicorrelarity.

For these reasons, in the forthcoming procedure of the study, the sample will be enlarged by adding all non-hub airports from other EU countries. Also, the quality of the data will be improved in

defining the variables such as size and GDP/head of the catchment area more realistically. It is expected that these steps will lead to an improvement of the model and its results.

What is more, the combined analysis of passenger and cargo traffic has led to the results above. The reason for the combined approach was that many passenger aircraft also carry belly cargo. On the other side, all-cargo flights have different demands of airport infrastructure compared to passenger airlines. With the catchment area probably being less important since the majority of cargo shipments is anyway trucked all over Europe, 24/24 opening hours might be of high importance for the forwarders because nightly arrivals and departures of longhaul flights are crucial.

For this reason, the following analysis only covers the passenger figures on longhaul flights (table 7).

Table 7: Impact of the variables "GDP/head" in the catchment area and "capacity situation at the nearest hub" on the supply of direct longhaul flights

Regression Statistics

Multiple R	R Square	Adjusted R Square	Standard Error
,871(a)	,758	,723	94490,38472

ANOVA

	SS	df	MS	F	Significance F
Regression	391378981249,385	2	195689490624,693	21,918	,000(a)
Residual	124998059264,733	14	8928432804,624		
Total	516377040514,118	16			

Coefficients

	Coefficients	Standard Errorr	T	P Value
(Konstante)	-498300,506	90601,709	-5,500	,000
BIP_CATCHMENT	13200,975	2040,977	6,468	,000
Hub_Capacity	210438,869	52781,576	3,987	,001

Despite of the small sample, the variables "Hub_Capacity" und "GDP_Catchment" now explain 75% of the regression, with the coefficient of determination being only slightly higher than the

adjusted one. In addition, the model delivers a high F-value. Thus, we can assume that these two variables have a strong influence on the supply of longhaul passenger flights.

As the “GDP/head” has always had a relatively strong, albeit not always significant influence in the conducted analyses, we can assume that it might also be of importance for the airlines. What the analyses have also shown is that the provision of a long runway alone will most likely not automatically lead to new longhaul services.

3 Conclusions

This paper is a summary of a study on longhaul flights from secondary airports which is still work in progress. We have discussed factors that might influence the supply of longhaul flights at non-hub or secondary airports. Using a data sample of 17 German airports from 2004, a multiple regression analysis was conducted to find out if these factors really have an impact on the output variables „longhaul WLU’s“ and „longhaul passengers“.

A first analysis for all 10 variables showed that our data did not have a significant influence and a high R^2. If the analysis is conducted with fewer variables, though, it can be assumed that the economic power of the catchment area has a positive influence. This seems realistic.

If the analysis covers the passenger traffic only, the variables “capacity situation at the nearest hub” and “GDP/head” seem to explain 75% of the regression.

A possible reason for these results which do not entirely meet our expectations is that some important variables such as the size and economic power of the catchment area have not yet been quantified adequately.

Thus, within the framework of our study, we will try to enhance the validity of the model in enlarging the sample size and in improving the quality of some of the variables.

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