

16TH ATRS WORLD CONFERENCE, JUNE 27-30, TAINAN, TAIWAN**DEMAND AND SUPPLY DEVELOPMENT PATTERNS OF LOW COST CARRIERS
IN AFRICA, AMERICA, EUROPE, AUSTRALIA AND ASIA**

Peter Berster, Marc Gelhausen, Dieter Wilken
German Aerospace Center (DLR)
Institute of Air Transport and Airport Research
51147 Cologne, Germany
Phone: +49 2203 601 2567
E-Mail: Dieter.Wilken@dlr.de

ABSTRACT

Low Cost Carriers (LCCs) have entered the European market in the late nineties and have achieved a market share of about 34 % in 2008, while Full Service Network Carriers (FSNCs) provided 58 % of seats available at European airports. While the growth of low cost air travel was rather dynamic until 2008, it has weakened since then and has become “normal”. The market share dropped to one quarter in 2011 in Europe. The success story of LCCs in the USA is much older, however, younger in Asia. The objective of the paper is to show development patterns of demand and of network extensions in the North American, European and Asian markets in order to compare them and draw conclusions regarding the future development of LCCs in these markets. It has been shown for the European market that the introduction of new LCC services on a route has created substantial new demand; the impact occurs immediately after taking up the service, however, lasts only for a short time, the development of demand follows then the normal trend of FSNCs. The generation effect of LCC services is thus strongly correlated with the extension of networks. Since networks in North America and Europe have been developed over long time the introduction of new routes becomes more and more difficult. In other parts of the world the LCC phenomenon is younger, there exist better possibilities to extend networks and generate new demand.

KEYWORDS

Low Cost Carriers; demand generation; network development; future development of low cost travel in world regions.

CLASSIFICATION

Airline Network Development; Air Transport Demand; Low Cost Carriers and Airline Competition

CORRESPONDING AUTHOR

Dieter Wilken

1. Introduction

Low Cost Carriers (LCCs) form meanwhile a well-established part of total air transport supply worldwide. There is no need to introduce them to the reader, much literature exists on the theme of low cost travel by air, and papers dealing with a broad spectrum of LCC related topics have been presented at former ATRC conferences. New developments of air transport demand, as for instance saturation of demand in some regions, and of supply factors, as for instance high fuel costs, however, are reason enough to continue with the analysis of LCCs and low cost travel in regions worldwide. While in the late nineties of the last century LCCs began extending networks in Europe it was in the years from about 2004 to 2008 that air travel by LCCs grew fastest, hand in hand with a strong extension of networks, and has lost momentum since then, caused in 2008 by the global economic crisis, but also by the fact that LCC networks in some regions had reached sizes that incorporated by then most routes with strong demand. In some regions like in Australia and Asia demand for low cost travel continues to grow strongly, however, in other regions like in Europe, the growth is slowing down, and in North America we can observe a stagnation of demand for low cost travel since 2007 and a reduction in total air transport demand.

The objective of the paper is to show these developments region by region on the demand side as well as on the supply side, and to compare them with the intention to draw some conclusions regarding the further development of LCC travel. The region specific developments of demand and LCC networks are not a base sufficient for making judgments on the future development of demand for low cost air travel, but have to be complemented by an analysis of demand on a route specific level. Experience in Europe has shown that the introduction of LCC services on a new route stimulates demand substantially, that this effect, however, lasts only for a short while, after which the demand development continues on a normal growth trend as can be observed on routes of full service network carriers (FSNCs). The demand generation of LCCs depends thus on the opening of new routes, a step that becomes more and more difficult to realize as in developed networks most sustainable routes are already served by one or more LCCs.

In the following we first describe the main characteristics of LCCs without attempting to define in detail what is meant by a LCC, they vary meanwhile too much in their business models. Based on these characteristics we can identify LCCs worldwide and describe them shortly. Based on data of the Official Airline Guide (OAG), which contain information on flight schedules of most airlines providing charter, LCC and normal scheduled services, and of Market Information Data Tapes (MIDT) of the computer reservation system of Sabre ADI, data describing the carrier specific demand route by route, we then show the development of total and LCC traffic volume (no. of passengers carried) globally and by region. These world regions follow the main subdivision of air markets in

- North America,
- South America (incl. Central America),
- Europe,
- Africa,
- Middle East,
- Asia,
- South West Pacific with Australia et al.

On the supply side we show the development of seats offered and routes served of total and LCC air traffic globally and by region. With these data we can comment and compare specific variables like the number of passengers per flight and route and the frequency of flights per route. Finally, we look into the route specific development of traffic volumes in order to show

the generation effect of new LCC services and draw some conclusion regarding the future development of LCC traffic.

2. Main Characteristics of LCCs

Against the background of about 100 airlines operating as LCCs globally we cannot attempt to define the LCC model which encompasses the business models of all these carriers: They vary more or less, however, offer their services as low fare services and claim to be low cost carriers. They feature at least several of the **key characteristics** identified in the classic model (CAPA, 2009):

- High seating density,
- High aircraft utilization,
- Single aircraft type,
- Low fares, including very low promotional fares,
- Predominant usage of internet-based booking,
- Single class configuration,
- Point-to-point services,
- No (free) frills,
- Predominantly short- to medium-haul routes,
- Frequent use of secondary and underserved airports,
- Rapid turnaround time at airports.

While Ryanair stands for an airline applying the low cost model in a pure form by offering very low fares with no frills and with extra charges for luggage, booking, fees and taxes, Air Berlin is a hybrid carrier serving low fare services as well as charter type and normal scheduled services, depending on the route type and competition conditions. The main prerequisite for airlines to offer low fares at sustainable conditions is to produce flights at low unit costs. LCCs exercise therefore a strict cost control in all phases of operations. Simplicity of all processes is the key factor for keeping costs low. The **operating model of LCCs** includes several components all of which are focused to reduce and keep costs down. As partly listed above, they are (Wilken, Berster, 2012):

- **Network Structure** with point-to-point services of relatively short and medium-haul (non-intercontinental) routes, with a preference of using secondary airports because of lower charges and slot availability, allowing high aircraft utilization, quick turnaround times and easier operations.
- **Uniform Fleet**, with typically one aircraft type, like A 320 or B 737, single class configuration and high seating density.
- **Direct Marketing** of services, typically via the internet and internet-based booking.
- **Price Strategy** of low fares, incl. very low promotional fares, on a one way base, however, with increasing fare levels in relation to the time span between booking and flying and the probability of seat availability (which is partly correlated with the time span), incorporating yield management systems, and a strategy of charging additional fees and taxes and for extra services like luggage.
- **No Frills** preceding, during and after the flight, including services in and infrastructure of the airport terminal.

Studies (e.g. Doganis, 2001, and Hansson et al., 2002, 2003) have shown that LCCs have operated commercially successful at 40-50 % of the **unit costs** of Full Service Network Carriers. However, the comparison of unit costs of some major FSNCs and LCCs in the US between 2005 and 2009 has shown that FSNCs have succeeded in reducing costs whereas LCCs were not able to keep their costs at original low levels. On the other hand, FSNCs lowered costs through restructuring and consolidating production and cutting back in services and quality. The commercial success of LCCs has thus caused traditional network carriers to reconsider their business model and adopt more features of LCCs, i. e. reduce costs in order to be more competitive and regain market penetration.

3. LCCs Worldwide

According to the key characteristics listed above and based on descriptions of airlines in their business reports we have identified altogether 94 airlines that could be classified as LCCs. Based on MIDT data, these 94 airlines carried around 650 Million passengers in 2010, which corresponds to a market share of 23.5 % of total passenger volume (2,768 Million passengers). According to OAG data, they operated 5.8 Million flights in 2010, while the total number of flights performed in 2010 was 30.6 Million. The global network is made up of 76.5 Thousand routes, and LCCs serve altogether 16.4 Thousand routes.

North America is the region with the longest LCC history; Southwest Airlines was founded back in 1971 and has become an example of a sustainably successful low cost carrier and has grown as such to the top position of US carriers and worldwide: Southwest has carried 112.4 Million passengers in 2010, the second biggest airline was Delta with about 106 Million passengers. Seven other LCCs have been identified in North America, with much smaller passenger volumes. All LCCs are listed in the order of the number of passengers carried:

- Southwest Airlines
- AirTran (now a wholly owned subsidiary of Southwest),
- JetBlue Airways,
- Westjet Airlines of Canada,
- Frontier Airlines,
- Spirit Airlines,
- Allegiant Air and
- Sun Country Airlines.

While the total air transport volume of North America was in the order of almost 800 Million passengers in 2010, the total LCC volume was 200 Million passengers; the market share was thus 25 %. Southwest alone carried 14 % of all passengers in North America.

In **South America** (including Central America) only five LCCs have been identified; they are in the order of size (passengers carried):

- Gol Transportes Aéreos,
- Azul,
- Interjet,
- Aires and
- REDjet.

These LCCs carried a total traffic volume of 47.5 Million passengers in 2010, which corresponds to a market share of 25 %. Similar to North America the LCC traffic in South America is dominated by just one carrier, Gol, which carried with more than 35 Million passengers 75 % of the total LCC passenger traffic.

No other of the defined world regions has more LCCs than **Europe**. Ryanair has adopted the Southwest model in the late nineties and has become with almost 70 Million passengers in 2010 the biggest LCC in Europe and after Southwest the second biggest LCC worldwide. Ryanair, however, has to share the low cost market in Europe with 41 other LCCs. Altogether they carried 240 Million passengers in 2010, which corresponds to a market share of 35 %. The five biggest LCCs in Europe are according to their passenger volume:

- Ryanair;
- Easyjet,
- Air Berlin,
- Norwegian Air Shuttle and
- Vueling.

Air Berlin is an example of a hybrid airline with variations in service and prices according to markets. Although they offer low prices and qualify as such as LCC their prices are typically higher than those of other LCCs in Germany, and in addition they provide charter like services to typical holiday destination areas.

The total air traffic market of **Africa** reached a volume of 82 Million passengers in 2010 and the LCC market a volume of 10 million passengers, representing a market share of 12 %. Eight LCCs serve the African market, with Kulula from South Africa being the biggest LCC with a traffic volume of 4 Million passengers in 2010. They are:

- Kulula,
- Atlas Blue,
- Mango,
- Jet4you,
- Air Arabia Maroc,
- Itime,
- Fly540, and
- Air Arabia Ägypt.

The African LCCs are mainly operating from South Africa and Northern African states.

In the **Middle East** we have identified six airlines as LCCs, they are according to their size:

- Air Arabia,
- Nasair,
- Fly Dubai,
- Jazeera Airways,
- Bahrain Air and
- Sama Airlines.

The Middle East air transport market is characterized by strong growth, both in total and the LCC segment. In 2010, all airlines of that region carried 143 Million passengers and the LCCs carried 12.4 Million. The total volume increased from 2010 to 2011 by 10 % to 158 Million passengers. The market share of LCC traffic is with 9 % still rather low.

Until 2010, North America was the biggest air transport market of the world, in 2011 **Asia** took the first place with 822 Million passengers, in comparison North America with 786 Million. The traffic in North America declined in that year, whereas the Asia market grew by 4.5 %. Like in the Middle East, the development of LCC traffic in Asia is rather young, only since 2005/2006 there are established networks of LCCs . In 2010, 21 LCCs carried 109 Million passengers, which represent a market share of 14 %. The five biggest Asian LCCs are:

- AirAsia,
- Citilink,
- Cebu Pacific,
- IndiGo Airlines and
- Thai AirAsia.

The **South West Pacific** region is dominated by the Australian market. Although the total air traffic volume of this region is with 88 Million passengers comparatively low the market share of LCCs is with almost 38 % the highest low cost traffic share of total market in the defined world regions. Three LCCs serve the market, they are:

- Pacific Blue Airlines,
- Jetstar Airways and
- Tiger Airways Australia.

4. LCC Traffic Development in World Regions and Airline Concentration

As compared with scheduled traffic of full service network carriers (FSNCs) LCC traffic is still a young phenomenon, however, not anymore a new segment of the total air transport system. The growth of low cost traffic was particularly strong in the first decade of this century, however, has slowed down since 2008 in some countries and world regions. The demand for LCC services is – among others – documented in MIDT data, which are available to us since 2002, so that the development of travel volume can be shown for the time span of 2002 till 2010 (see Fig. 1).

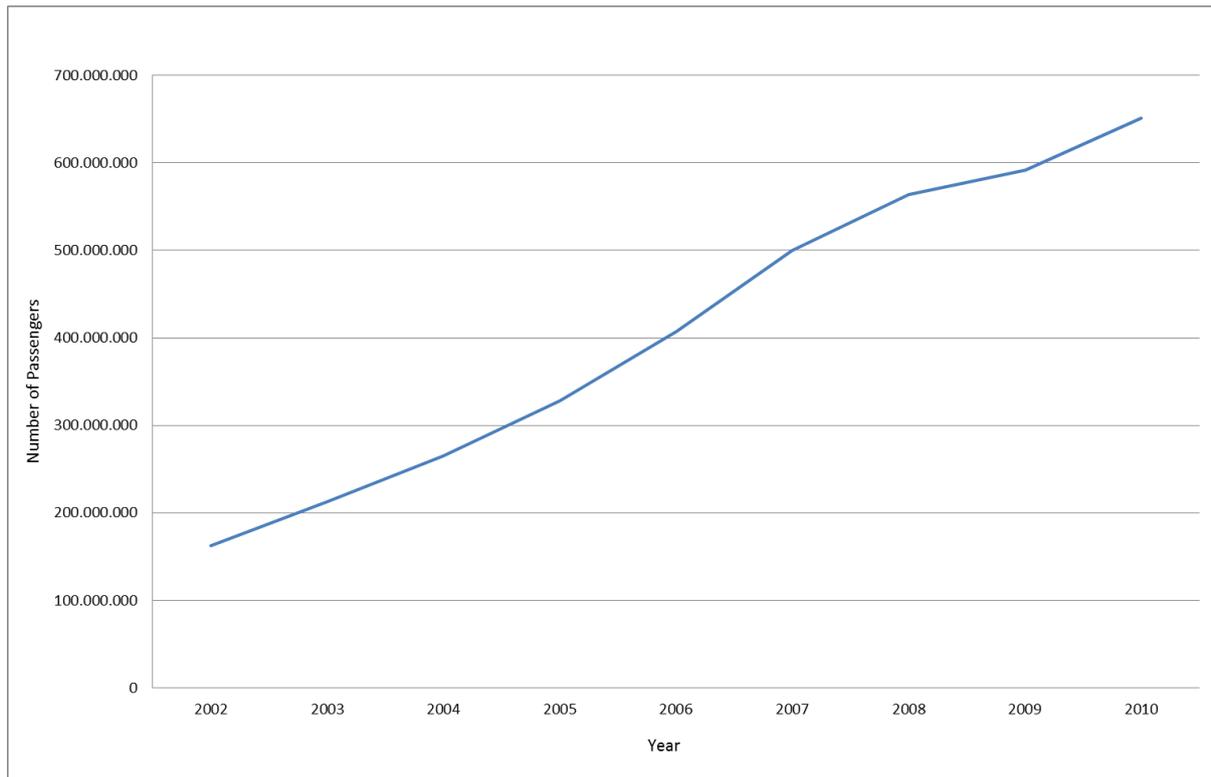


Fig. 1: Development of Global LCC Traffic (No. of Passengers), 2002-2010;
(Source: Sabre ADI, DLR)

In an almost linear development, LCC travel volume has grown from 160 Million passengers carried in 2002 to 650 Million in 2010; on average annually by 60 Million passengers. While in 2010 altogether 94 LCCs transported the total volume, there were only about 40 LCCs in the year 2002 to serve the demand. Looking at the global development of LCC traffic one is inclined to assume similar linear development patterns in the world regions and in countries. Of course, this is not the case, as is shown in Fig. 2.

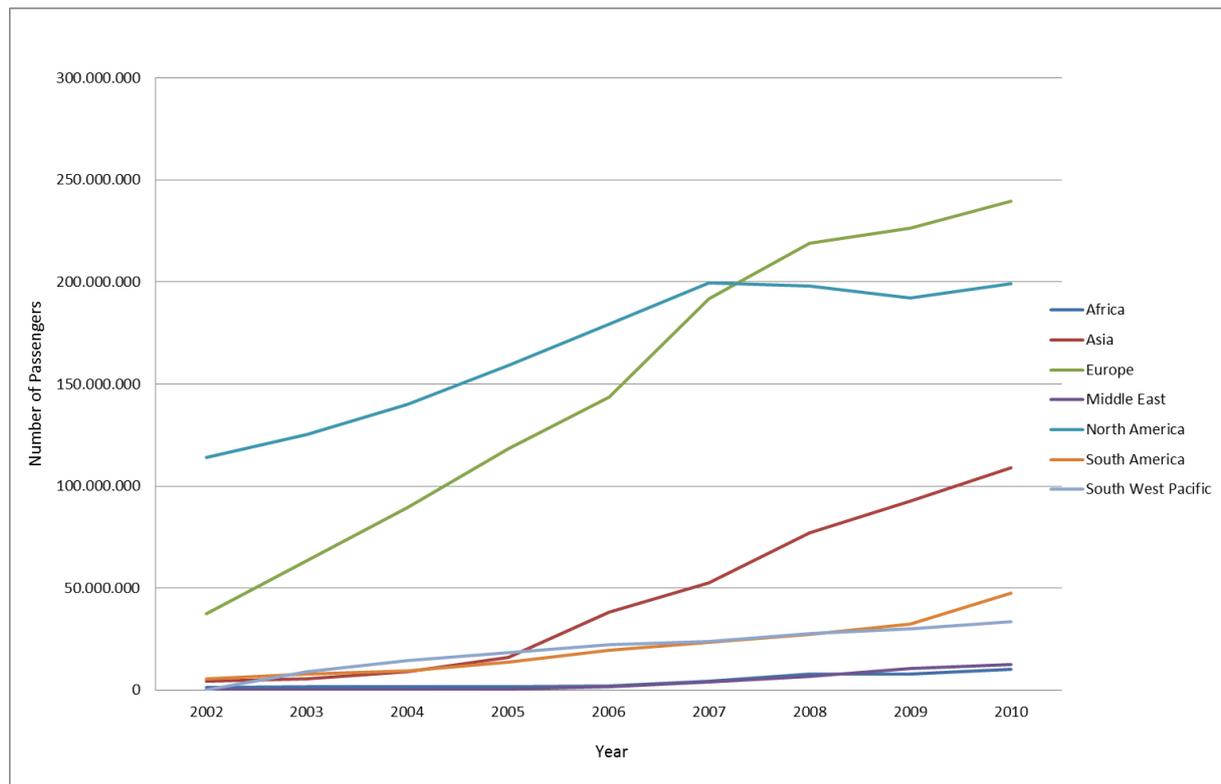


Fig. 2: Development of LCC Traffic in World Regions (No. of Passengers), 2002-2010; (Source: Sabre ADI, DLR)

North America and Europe are the regions with the highest low cost traffic, with 200 Million passengers in North America and 240 Million in Europe, however, the growth has come to a halt in North America and has slowed down in Europe since 2007. The other regions have much lower low cost traffic volumes, their growth, however, is still unrestrained. Asia, the region with the third highest low cost traffic volume, has reached after a strong linear growth since 2005 a level of nearly 110 Million passengers in 2010. As can be seen in Fig. 2, the traffic growth was similar in Europe and North America in the years from 2002 to 2007. LCCs had started earlier to develop networks in Europe and in particular the United States, and it seems that these networks have reached sizes and densities which make it more and more difficult for LCCs to add new economically viable routes and frequencies, again particularly in the United States, where the number of passengers has been stable since the year 2007.

Competition environment and operating conditions of LCCs vary from region and country to region and country. Whereas for instance in North America most LCC traffic is of domestic nature and in Europe of a common market nature, traffic in other regions is often international and thus more or less limited by bilateral air service agreements. On the other hand, in North and South America two dominant carriers – Southwest Airlines and Gol Transportes Aéreos - have evolved, whereas in the other regions more carriers have succeeded in achieving higher market shares. As an example the airline specific developments of LCC traffic for North America and Europe are shown in Fig. 3 and 4.

The LCC situation in North America is characterised by a strong position of Southwest; within an ensemble of 8 LCCs this airline has a share of the total low cost market of about 55 %. In Europe, a market of similar size, there are more than 40 airlines serving the low cost market; the biggest LCC being Ryanair, which carried in 2010 almost 70 Million passengers. In contrast to Southwest, the market share of Ryanair was only 29 %. Easyjet and Air Berlin follow in size, all other LCCs have passenger volumes of less than 15 Million and are thus of similar size as the North American LCCs.

5. Total and LCC Traffic Development, Market Share

LCC services form one segment of the total air transport supply, it is therefore consistent to view the LCC development also as part of the total traffic development. In Fig. 5 we show the development of global and LCC passenger volume and of LCC market share since 2002.

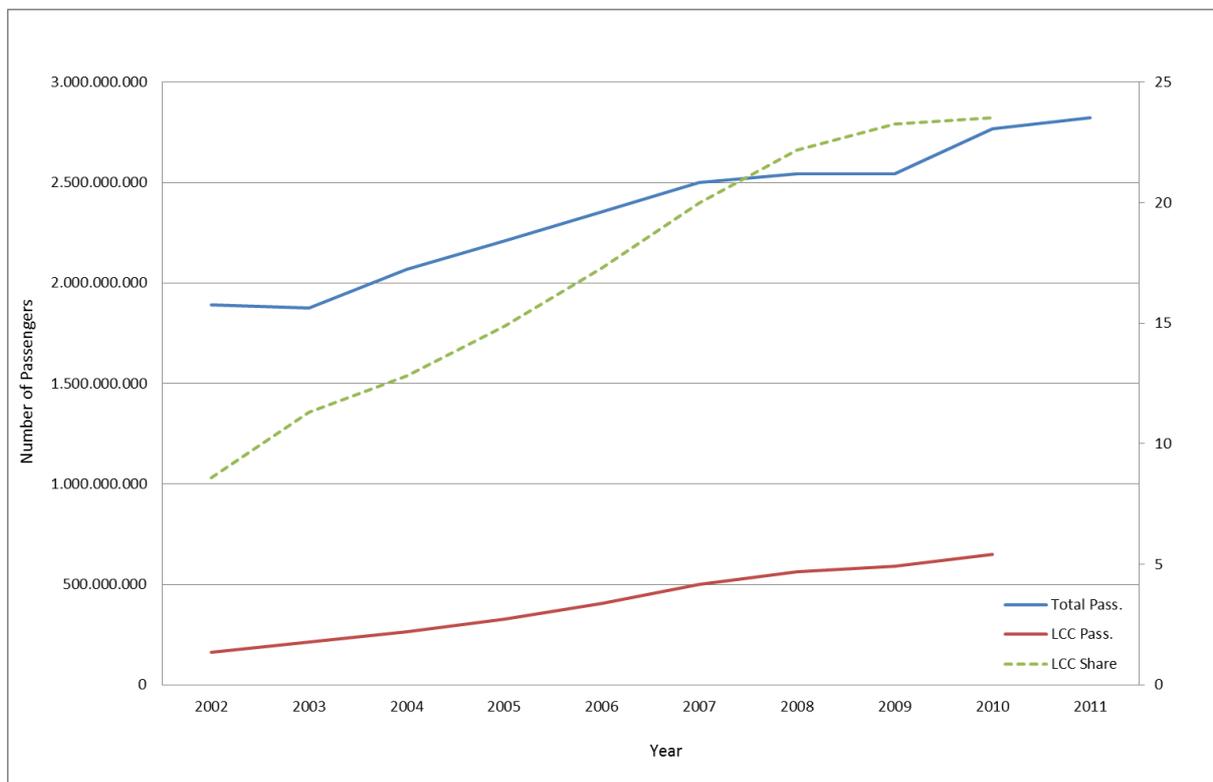


Fig. 5: Development of Global LCC and Total Air Traffic (No. of Passengers) and LCC Market Share, 2002-2010; (Source: Sabre ADI, DLR)

After two periods of stagnation in 2002 due to terrorism and in 2008/2009 due to a global economic crisis total passenger volume reached a volume of 2,768 Million passengers in 2010. In the same period, LCC traffic grew – more or less uninfluenced – from 160 Million passengers carried in 2002 to 650 Million in 2010. Because of the relatively stronger LCC growth the market share increased from about 8 % in 2002 to 24 % in 2010. As can be seen the market share grew almost linearly until 2008 annually by 2.5 percentage points on average, but since then much less so. It seems that the world LCC share proceeds towards a

saturation level somewhere in the range of 25 to 30 %, although in some regions and countries this level may be significantly higher, as can be seen in South America, Europe and Australia.

These developments – LCC and total passenger volume and LCC market share - have been elaborated for each of the world regions. As can be expected, each region has its own development pattern, ranging from slow growth in the beginning, due to the building-up process of LCC services, to strong growth towards the end of the period, over linear growth over the whole period to decreasing growth in almost saturated markets with stagnation towards the end of the period. The region specific developments are shown in Fig. A1 - A7 in the Annex.

An example of a developing market is the Middle East region as can be seen in Fig. A5. The low cost traffic in the Middle East started only in 2005/2006 and has reached a share of less than 10 % in 2010. Looking at the development of total air traffic in that region, one has the impression that traffic growth proceeded dynamically only after 2005/2006, too. The markets in Africa (Fig. A4), Asia (Fig. A6) and South America (Fig. A2) showed similar development patterns as in the Middle East, although each at different traffic levels. While the LCC market shares in Africa and Asia have grown fast in the past, as in all regions, their levels are with 12 to 14 % still rather low. Although South America is also a rather young LCC market, having started in the beginning of this century, its market share has grown already to 25 % in 2010, without any sign of saturation.

An example of a different growth pattern is Europe, where both the total and LCC traffic slowed down recently in their growth as compared with the years before 2007/2008 (see Fig. A3). Europe seems to have reached a near mature degree of market penetration. LCCs are now carrying 35 % of the total passenger volume, with the absolute volume still growing, however, with a slower pace than in the period before 2007/2008.

The West Pacific region is a market with a development pattern somewhere between the young Asian and the more mature European market. There are some signs of decreasing growth rates in the total passenger volume development since 2008, however, no such signs of retarding growth in the LCC segment, although the market share has reached already a record value of 37 %. As can be seen in Fig. A7, the market share of low cost travel in the West Pacific region may still increase in future.

A market development beyond those we have seen so far is the one in North America. (see Fig. A1). The total market hasn't grown since the year 2004 and since 2007 traffic has gone down, while the LCC traffic has stagnated since the same year. In addition, the market share of LCCs seems to have reached with 25 % a level from which further growth is rather unlikely. The North American market is the most mature air traffic market of all regions and is characterized by not only a dominant LCC, Southwest, but more importantly by strong competition between some big national carriers and the few LCCs. Probably nowhere else is the difference in unit costs between LCCs and non-LCCs so small as in North America.

6. Development of Supply (Flights, Routes) in LCC and Total Air Traffic

Based on OAG data, the total **number of flights** in commercial air transportation has grown from 28.13 Million flights in 2002 to 30.58 Million in 2010; at the time the LCC flight volume has grown globally from 1.89 Million to 5.84 Million flights. The flight development was similar to the passenger development (see Fig. 5), however, with one big difference: The growth of the number of flights was much weaker than the demand growth. While the total

number of passengers carried grew from 2002 to 2010 by 4.9 % annually the number of flights grew only by 1.05 %, indicating that the average seat capacity of aircraft has increased. In fact, the average number of passengers per flight has increased by 3.9 % on average, and the average load factor has increased as well, however, not as strong since the load factor was already rather high ten years ago. An exact specification of these indicators passengers per flight or load factor (passengers/seats) is not possible, since two data sets – MIDT and OAG – would have to be combined, which have been derived from different primary sources.

As we have seen the passenger volume of LCCs has grown much faster than the total volume; the number of LCC passengers grew on average by 19.2 % from 2002 to 2010. The number of flights offered has also grown faster, on average by 15.1 % annually. In low cost travel, too, flight efficiency in terms of passengers per flight has gained over time by 3.4 % annually. In addition, flight efficiency of LCCs is higher than of FSNCs; as compared with the total LCCs have carried 22 % more passengers per flight in 2010.

As with the passenger growth, the development of flights in the regions varies significantly, however, is not so different when the passenger and flight development per region are compared. Flight volumes have increased strongly in the relatively young air transport markets in Africa, Middle East and South America since 2005/2006, both in total as in LCC traffic (see Fig. 6). In Asia flight volumes in total and LCC traffic had begun to grow earlier, like in Europe and North America. In Europe LCC flight volumes have developed in an S-shaped form over time, a typical growth development of many natural phenomena. The development of the LCC market share in Europe has followed an S-shaped curve as well.

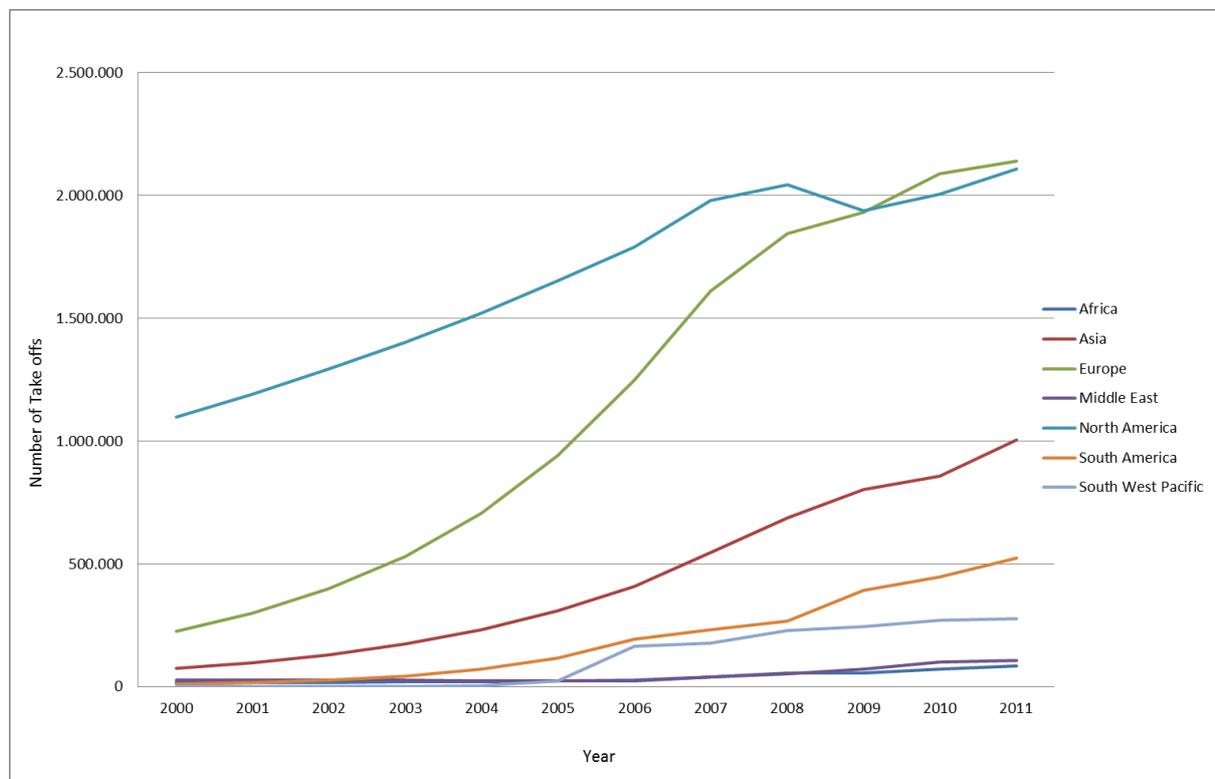


Fig. 6: Development of LCC Flight Volume in World Regions (No. of Flights), 2000-2011; (Source: OAG, DLR)

In North America the LCC flight development follows the same pattern as the passenger growth: Until 2007 the number of flights in low cost travel grew linearly and stayed more or less constant since then. In contrast, the total number of flights showed another development than the number of passengers carried. While the passenger volume grew from 752.3 Million in 2002 to 854.3 in 2007 and subsequently dropped again to volume of 796.1 Million in 2010, however, grew on average by 0.7 % annually, the flight volume dropped from 12.64 Million in 2002 to 10.63 in 2010, on average annually by 2.2 %. The effect was even more pointed in South West Pacific. While both the demand and flight volume of low cost traffic grew strongly, the total passenger demand grew as well, from 53.9 million in 2002 to 88.4 in 2010, however, the total flight volume dropped in the same time from 1.15 Million in 2002 to 1.05 in 2010.

On the global scale, the development of the **number of routes served** was similar to the demand development. On the regional scale, there are greater differences between regions as well as between the demand and route development. The total number of routes has grown from 62.3 Thousand in 2000 to 76.4 Thousand in 2010, on average by 2.1 % annually and thus weaker than the number of passengers but stronger than the number of flights. The networks of LCCs have been developed much faster than those of FSNCs. The number of routes of LCCs has grown globally from 2.3 Thousand in 2000 to 16.5 Thousand in 2010, on average by 21.8 % per year. The network extension of LCCs has thus grown a bit faster than the demand for travelling on these routes.

In Africa and the Middle East LCCs developed their networks mainly after 2005/2006, but didn't reach sizes exceeding 500 routes (see Fig. 7). In the South West Pacific region as well, the LCC network grew steadily up to 280 routes in 2010, although the total number of air traffic routes served in that region decreased from 2.1 Thousand in 2002 to 1.65 Thousand in 2010 in spite of a growing demand. A steady growth of the LCC network until 2010 has also been observed in Asia, South America and North America. The continuing growth of the number of LCC routes in North America is somewhat surprising against a background of a falling total number of routes and a stagnation of LCC demand since 2007. As can be seen, the growth came to a halt in 2010, and the number of routes decreased by almost 100 routes in 2011. The route network development in Europe has followed an S-shaped growth like the flight development, and has reached a size of 8.35 Thousand routes in 2010 and with that a share of all routes of 47 %. With this number of routes, Europe has by far the most extensive LCC network, to be followed by North America with almost 3 Thousand routes and Asia with 1.3 Thousand routes.

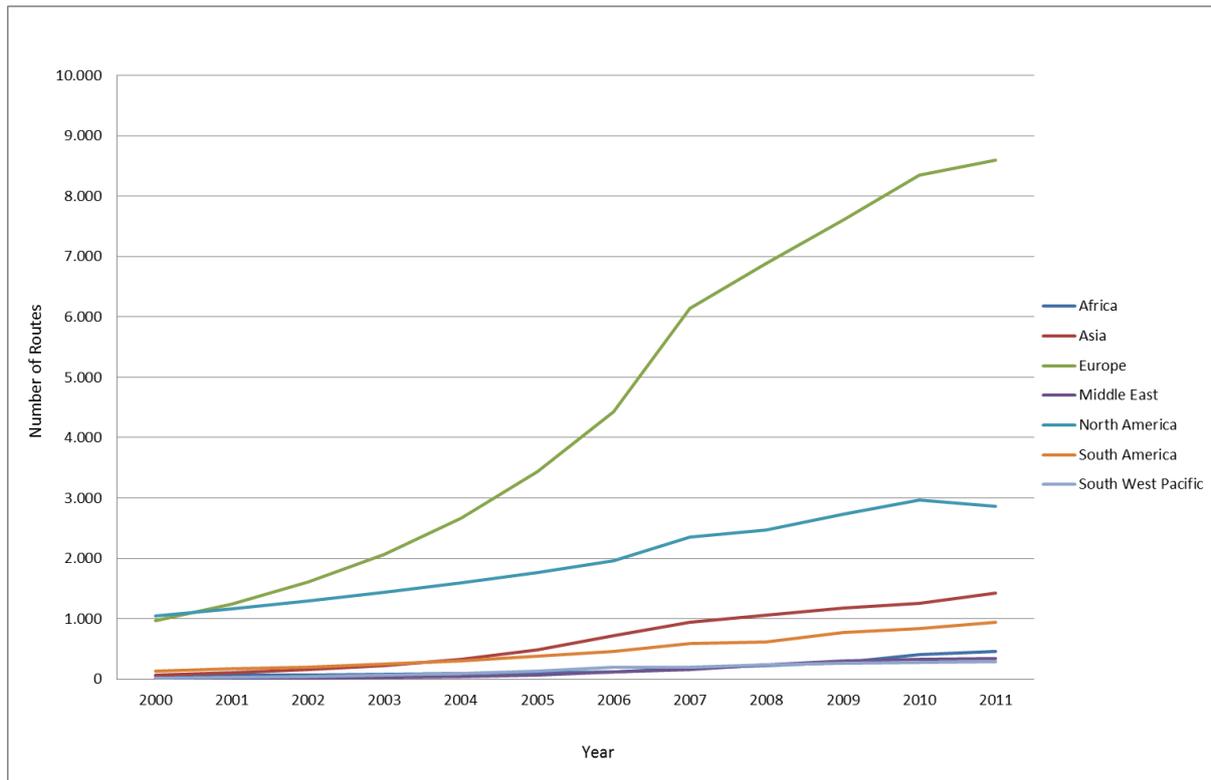


Fig. 7: Development of LCC Route Volume in World Regions (No. of Routes), 2000-2011; (Source: OAG, DLR)

If we look into the route development by carrier we see the second biggest LCC, Ryanair, as the most dynamic LCC in terms of extending the network and operating the biggest network. In 2006, Ryanair, Southwest, the biggest LCC, and Air Berlin served about 800 routes each. In 2010, Air Berlin served almost 1,200 routes, about the same number as Easyjet, the third biggest LCC, Southwest served not more than about 950 routes, and Ryanair operated a network of over 2400 routes. This means that Ryanair has a much smaller demand per route than Southwest. If we want to get a quantitative idea of the demand we have to relate MIDT data with OAG data, which gives us only a rough estimate, since the data sources are different. Nevertheless we find that Southwest carried on average about 120 Thousand passengers per route in 2010 whereas Ryanair had less than 30 Thousand passengers per route. This again means that Southwest has a much higher flight frequency per route than for instance Ryanair. Indeed, Southwest had an average frequency of 1,200 flights per year per route (or a weekly frequency of 23), whereas Ryanair operates on average only 200 flights per route (or 4 flights per week). All LCCs have reduced their flight frequency in recent years. Since Ryanair is serving primarily the price sensitive demand a low frequency is not as detrimental for the service quality as would be in case of serving business travel demand. An average weekly frequency of 4 flights means not a daily flight per weekday, which is well below 2 flights per weekday, which is regarded the minimum frequency for business travelers on short distance flights.

7. Traffic Development Patterns of LCC Market Share

As can be seen from the previous analyses (see Chapter 5), the development of the market share of LCCs follows some kind of S-shaped sigmoid curve. Market maturity seems to be

one important factor: Market share of LCCs increases only slowly year by year, if carriers are well established, as is the case in the North American market. In contrast, markets like Asia or the Middle East show a much more dynamic development as LCCs are a relatively new phenomenon there. However, market maturity is not the only factor determining low cost share: The North American low cost market is a well-established one in terms of a relatively long history of LCCs in the air transport market, is however, characterized by strong competition between major carriers. But nevertheless, a market like Europe has a much higher LCC share after a much shorter time period than the North American market (35% for Europe vs. 25% for North America). Our hypothesis is that the competitive situation of LCCs plays a role, too, for overall market share. Thus, we identified the number of LCCs (NUMLC) and the ratio of air passengers of a given region (all, not just low cost) to the number of low cost carriers (PASSLC) important factors in describing the development of LCC share by region. E.g., NUMLC takes a value of 8 for the North American market, whereas the value for Europe is between 15 (2002) and 39 (2007 & 2008). The ratio PASSLC is about 100,000,000 passengers per low cost carrier for North America, but only roughly a fifth for Europe. It seems that the number of LCCs and (in a statistical sense) on average less overall passengers per LCC stimulate low cost carriers to raise air passenger potential by enhancing competition between them. Therefore, the dominance of Southwest in the North American market might have slowed down the development of the low cost sector compared to a market like Europe.

Table 1 displays the results of a model based estimation of the LCC market share in world regions. We have employed a binary logit model, with a maximum attainable share of low cost carriers of 40%. We have tried different values, the level of 40% produced the best results. We do, however, not claim that exact 40% is the maximum value which can be reached asymptotically, but rather an order of magnitude of 40% +/- 2% to 3%. Furthermore, we do not primarily see this model as a tool for precise forecasting, but rather for structuring and classifying observed patterns of development. The model is a simple one and only a stylized description of the low cost share development. However, model fit and explanatory power of the model is not as poor as the rather low pseudo-R² value of 17.76% might at first sight suggest. The quality of the model is illustrated in Fig. 8, which displays a comparison between actual and modeled values for the three largest markets. In general, pseudo-R² values depend on the study at hand and are therefore hard to compare between different studies. As a result, it is difficult to define a pseudo-R² value beyond which all models are “good”.

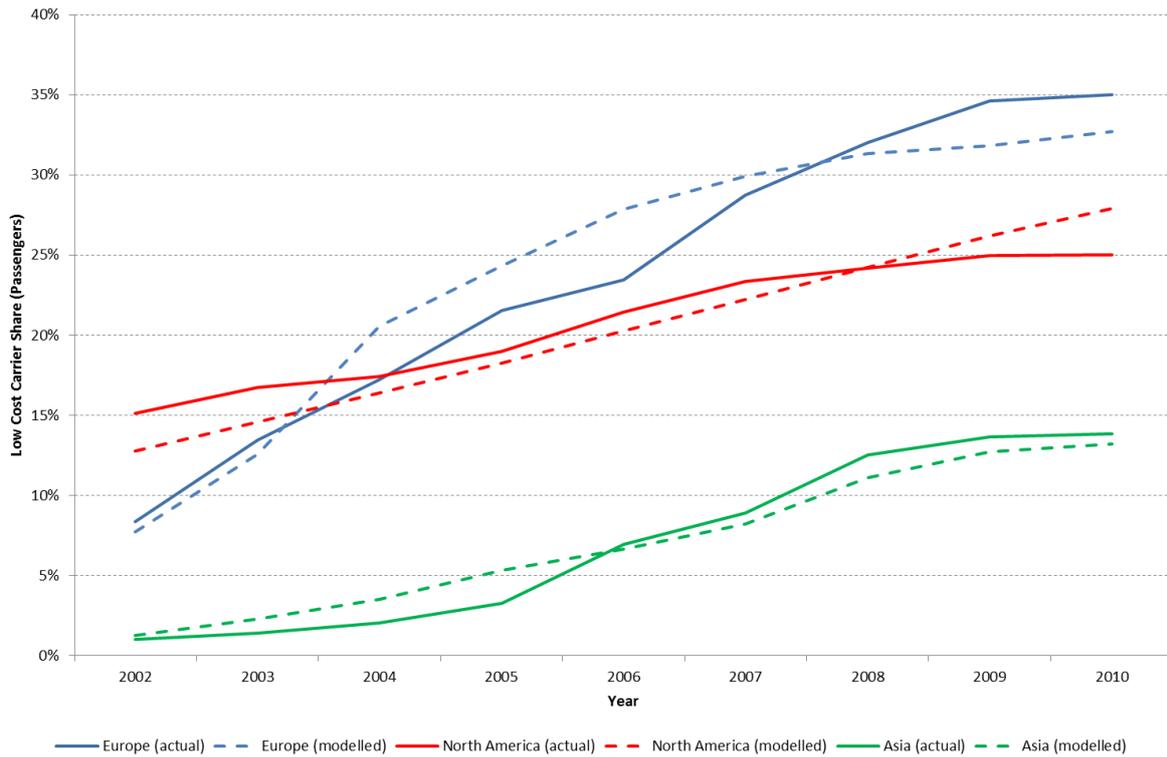


Fig. 8: Actual vs. Modeled Low Cost Carrier Shares in Asia, Europe & North America

The functional form of the model is a modified binary logit model, or a modified logistic regression, respectively:

$$P = \frac{0.4}{1 + e^{-z}}$$

P is the expected share of low cost carriers in terms of the percentage of air passengers transported and can take a maximum value of 0.4, if the value z tends asymptotically to infinity. The function z is linear in form and Table 1 lists the estimators for the coefficients β_j :

$$z = \sum_j \beta_j * x_j$$

CONST is the alternative specific variable for low cost offers. LIB describes the number of years since market liberalization, e.g. 2012 – 1997 = 15 for Europe. AFRICA, ASIA et al. are market specific constants. All coefficients are significant at the $\leq 1\%$ level.

Variable	Coefficient	pseudo-R²
CONST	-1.794 ***	17.76%
NUMLC	0.0624311 ***	
LIB	0.199858 ***	
PASSLC	-1.7516E-09 ***	
AFRICA	-1.29544 ***	
ASIA	-2.75801 ***	
AUSTRALIA	2.28492 ***	
EUROPE	-1.52103 ***	
MEAST	-1.35818 ***	
NAMERICA	-3.89322 ***	

*** Significant at the $\leq 1\%$ level

Table 1: Estimation Results

However, the size of the market specific constants suggests that there are more important factors determining the share of low cost traffic and structural differences between some pairs of markets. Furthermore, there seems to be a somewhat different situation especially in Australia and to some extent in North America, because the values of their market specific constants are rather different from those of other markets. This leads to an unusual high LCC share in Australia and a rather low share in North America. Furthermore, the LCC share in Europe benefits from the high number of LCCs and many of them were founded before the liberalization process in Europe started. Thus, many of those carriers were able to develop prior to liberalization in a more or less “protected” environment due to the many different countries in Europe as opposed to North America. For the larger markets, i.e. Asia, Europe and North America, there is a positive correlation between number of countries and different low cost carriers.

The development over time of LCC traffic and total air traffic in world regions suggests a similar model treatment for each of these segments, since finally all traffic developments follow some kind of a logistic function. It seems that in relatively young markets as in Asia and the Middle East the traffic growth follows the S-curve on the lower part whereas in more saturated markets as in North America and Europe traffic growth has passed already these high growth phases of the general growth function and is approaching the slow growth part or even the final stagnation part. It is intended to model these region specific markets as well, however, with more complex functions and more region specific variables.

8. Demand Generation of LCC Services

We know from route specific passenger statistics that LCCs typically attract substantial new demand when opening new low fare services. However, what we do not know is where these new passengers come from. Do they substitute modes and/or destinations? Do they take up an air journey instead of following another activity, so that we can speak of genuinely newly generated demand? Market researchers of airport companies in Germany estimate that about 40 to 60 % of all LCC passengers come from other airlines or other modes of transport. This means on the other side that about half of the passengers form newly generated demand due to the low fare services. With the gain in market share LCCs not only captured passengers from other airlines in direct competition and transfer passengers from hub services in a more

indirect competition with FSNCs, but in particular newly generated passengers who otherwise would have not travelled by air or not travelled at all. In a strict sense, only the latter ones belong to the demand generated by LCC services.

We do not have passenger surveys that would give information on the share of generated demand, however, we can show the total generation effect of new LCC services on the demand by looking at the development of demand before and after the introduction of new LCC services. On a series of LCC routes in Germany it has been shown that the introduction of LCC services on a link where normal scheduled services had already been available, or the opening up of such services on a new route, has a great impact on the demand, that is on passengers substituting for traditional air services and services of other modes as well as on new passengers substituting for other activities, including non-travel activities (Wilken, Berster, 2012). There have been numerous examples where the effect on demand was in the order of more than 10,000 passengers per month attracted to the new LCC services. Secondly, the impact occurs immediately after the introduction of new services and lasts only for a short time, say a few months; the development of demand follows then the former trend.

The question is whether or not this passenger behavior can be observed in other world regions as well? To answer that question we have analysed a number of routes where new LCC services had been introduced. Four example routes have been selected to demonstrate the generation effect:

- Cologne – Barcelona, a European route, without direct services before the introduction of LCC services
- Philadelphia – Chicago Midway, a domestic US route, without direct services before the introduction of LCC services,
- Denver – Oakland, a domestic US route, with direct FSNC services prior to the introduction of LCC services
- Mumbai – Nagpur, a domestic route in India, with direct FSNC services prior to the introduction of LCC services.

The Cologne-Barcelona route is a touristic route, but also used by business travelers. Before the German LCC Germanwings entered the market in Winter 2002/2003 with low fares, only indirect FSNC services at normal prices of scheduled flights were available for potential passengers. About 1,500 passengers per month have chosen these services, and we can assume that these passengers were primarily business travellers. As can be seen in Fig. 9, after the introduction of Germanwings services, between 3 and 4 Thousand passengers have chosen to fly on this route, mainly the direct low fare services of Germanwings. These additional 2 Thousand passengers per month were travelling mostly for private reasons. The diagram shows clearly, too, that the generation effect comes directly after the introduction of the new low fare services, after some months of service the demand development follows the former pattern.

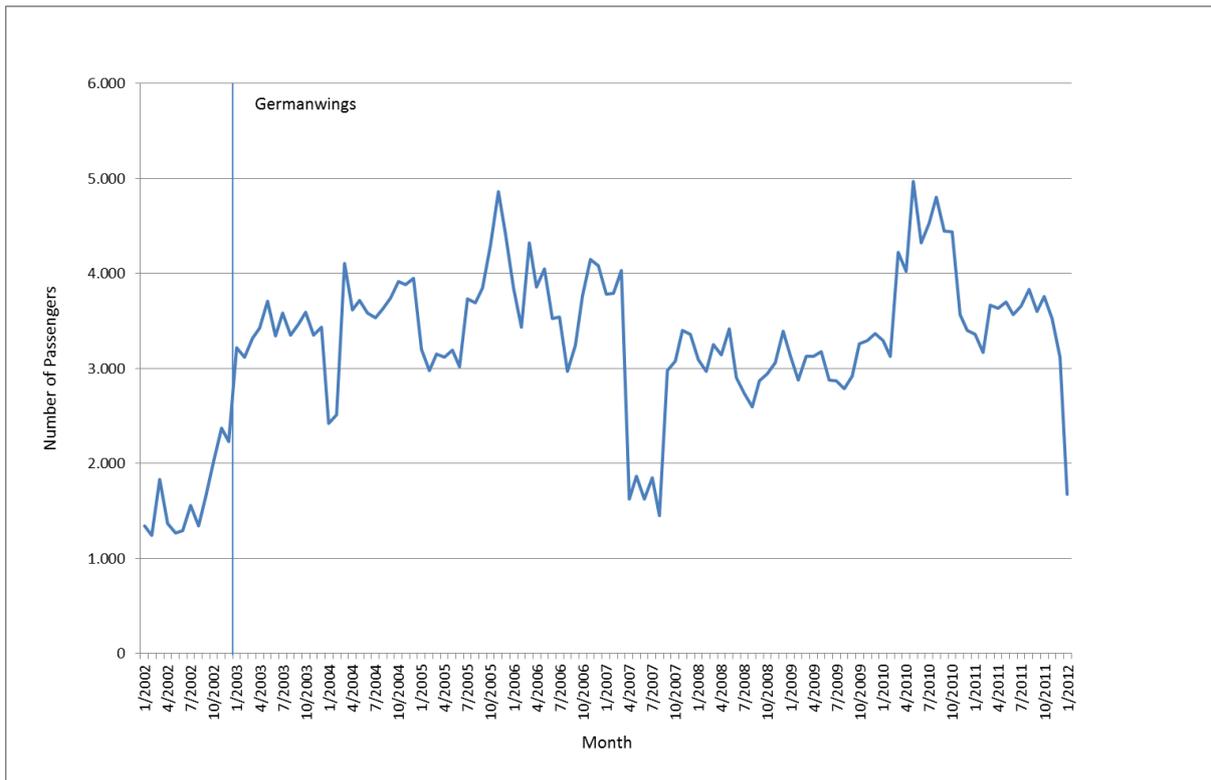


Fig. 9: Demand Development on the Cologne-Barcelona Route
(No. of Passengers per Month) 2002-2011; (Source: Sabre ADI, DLR)

Two domestic routes of the US are other examples showing the generation effect. The Philadelphia-Chicago-Midway route (see Fig. 10) was, as the Cologne-Barcelona route, connected only by indirect services before a LCC, in this case Southwest, entered the market. The new low fare services attracted on average about 5 Thousand passengers per month. After the introduction of the new services the passenger volume reached very shortly the new level, and traffic development continued on the old path.

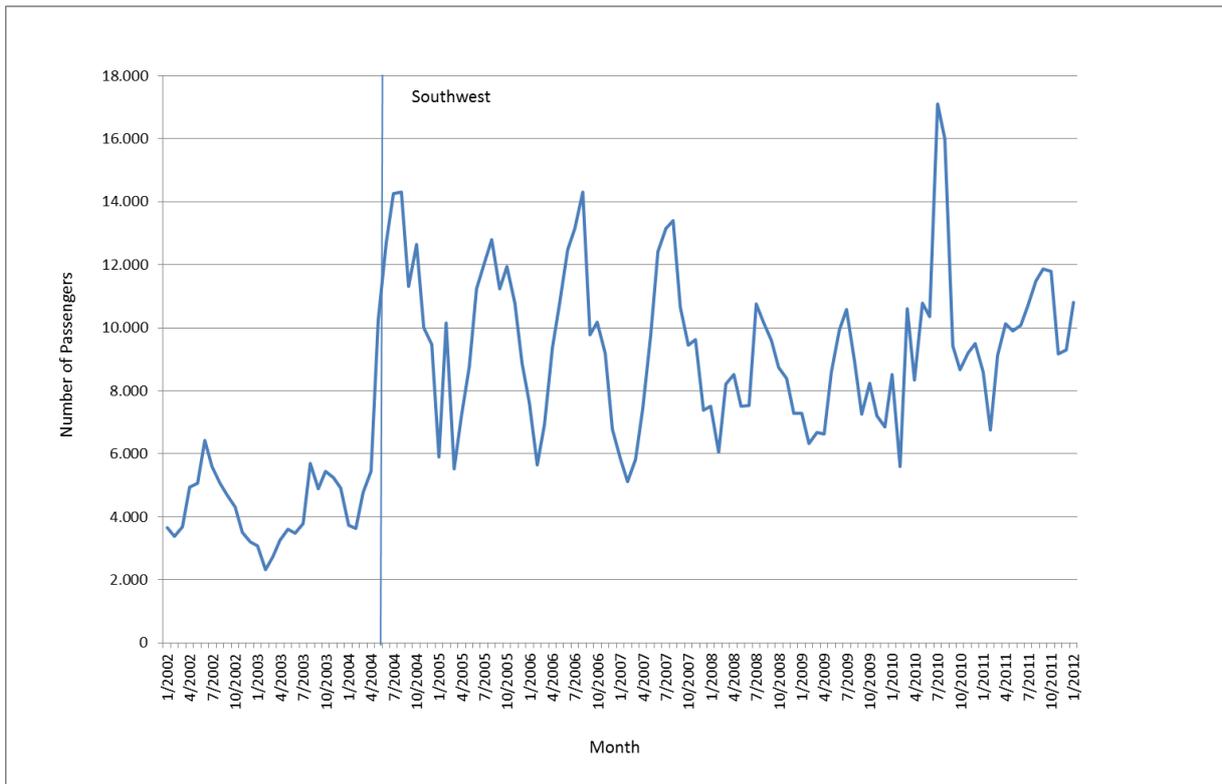


Fig. 10: Demand Development on the Philadelphia-Chicago-Midway Route (No. of Passengers per Month) 2002-2011; (Source: Sabre ADI, DLR)

The Denver-Oakland link (see Fig. 11) had established services before 2002, primarily by United Airlines, and after Southwest entered the market in Winter 2006/2007, the demand for these services grew immediately, while the demand for United services gradually decreased until a volume of about 1,500 passengers per month was reached. After the initial generation of nearly 10 thousand passengers the demand for Southwest services remained in the order of 9 Thousand passengers, while the total demand gradually decreased to a level of over 10 Thousand passengers.

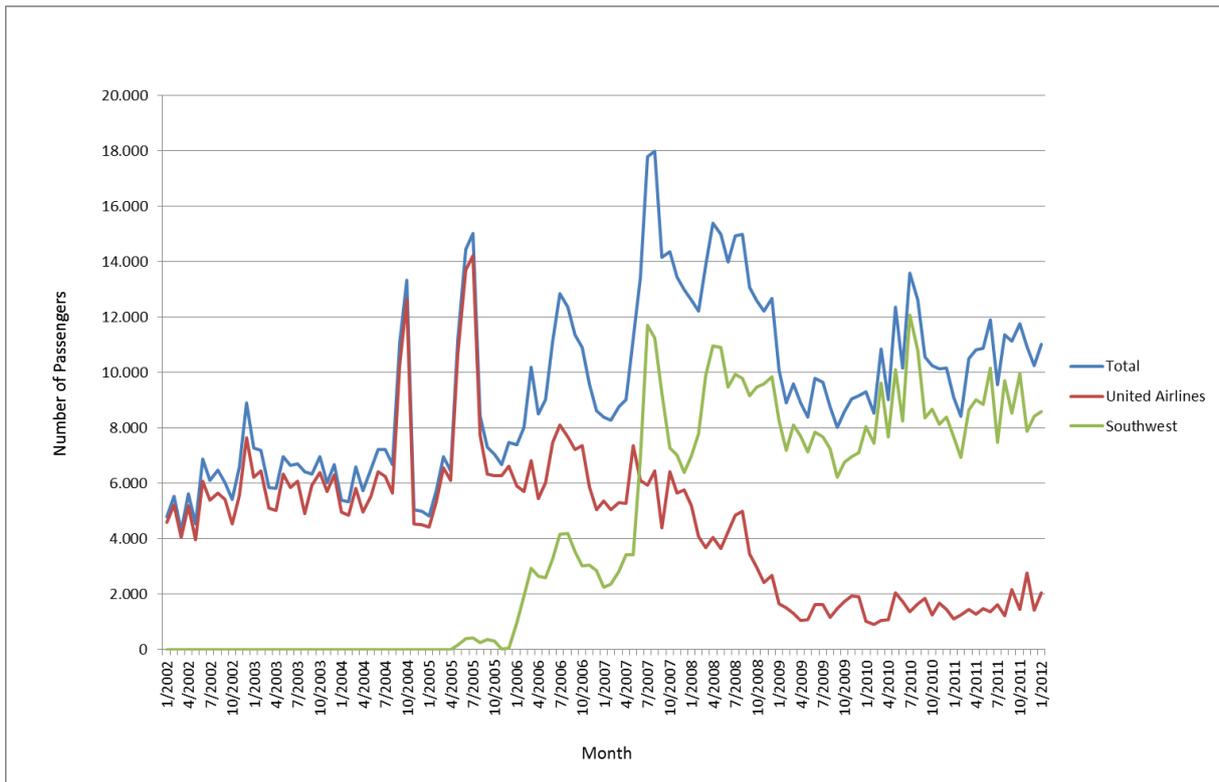


Fig. 11: Demand Development on the Denver-Oakland Route (No. of Passengers per Month) 2002-2011; (Source: Sabre ADI, DLR)

The fourth example is a domestic route in India between Mumbai and Nagpur (see Fig. 12) which had a rather low demand of nearly 5 Thousand passengers, before IndiGO and Air Deccan opened new low fare lines. They attracted more than 15 Thousand new passengers, however, with pulling out of the market of Jet Airways in Winter 2009 the demand went down to a level of about 12 Thousand passengers. After that, the demand for the low fare services grew faster than in the period before the two LCCs had entered the market, a phenomenon that has not been observed as such in developed markets in Europe and the US. The immediate reaction of the market in terms of a fast growth of demand can be seen in this developing market as well.

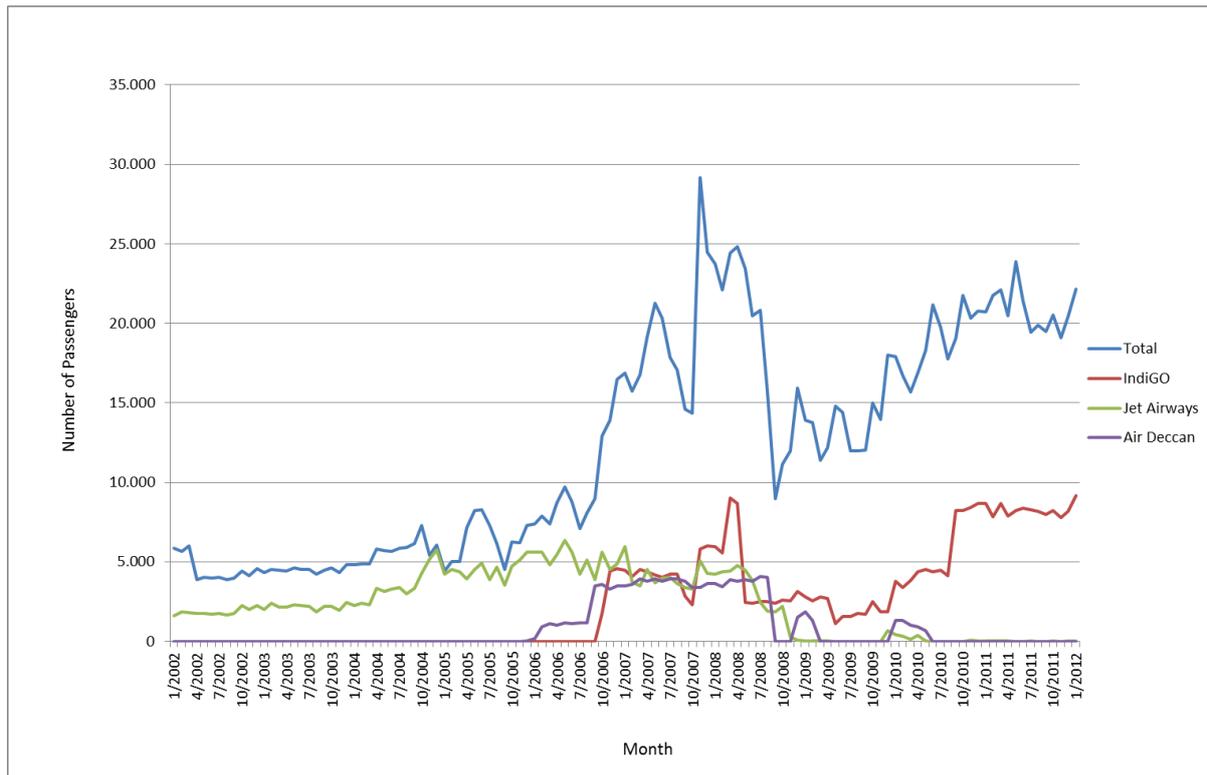


Fig. 12: Demand Development on the Mumbai-Nagpur Route
(No. of Passengers per Month) 2002-2011; (Source: Sabre ADI, DLR)

Other routes have been analysed with similar results; demand reactions have been strong and occurred immediately. We may conclude therefore that the introduction of LCC services generate substantial new demand. The effect is following immediately and the demand follows then on the higher level the former development trend, in developing markets the demand grows faster than in the past.

9. Results and Discussion

The **objective of the paper** is to show the developments of low cost transport region by region on the demand side as well as on the supply side, and to compare them with the intention to draw some conclusions regarding the further development of LCC travel. Experience in Europe has shown that the introduction of LCC services on a new route stimulates demand substantially, that this effect, however, lasts only for a short while, after which the demand development continues on a normal growth trend as can be observed on routes of full service network carriers (FSNCs).

Low Cost Carriers (LCCs) form meanwhile a well-established part of total air transport supply worldwide. While in the late nineties of the last century LCCs began extending networks in Europe it was in the years from about 2004 to 2008 that **air travel by LCCs grew** fastest, hand in hand with a strong extension of networks, and has lost momentum since then, caused in 2008 by the global economic crisis, but also by the fact that LCC networks in some regions had reached sizes that incorporated by then most routes with strong demand. In some regions like in Australia and Asia demand for low cost travel continues to grow strongly, however, in other regions like in Europe, the growth is slowing down, and in North

America we can observe a stagnation of demand for low cost travel since 2007 and a reduction in total air transport demand.

Against the background of almost 100 airlines operating as LCCs globally we cannot attempt to define the LCC model which encompasses the business models of all these carriers: They vary more or less, however, offer their services as low fare services and claim to be low cost carriers. They feature at least several of the **key characteristics** identified in the classic model (CAPA, 2009) such as high seating density, high aircraft utilization, single aircraft type, low fares, including very low promotional fares, predominant usage of internet-based booking, single class configuration, point-to-point services, no (free) frills, predominantly short- to medium-haul routes, frequent use of secondary and underserved airports and rapid turnaround time at airports.

According to these key characteristics and based on descriptions of airlines in their business reports we have identified altogether **94 airlines that could be classified as LCCs**. Based on MIDT data, these 94 airlines carried around 650 Million passengers in 2010, which corresponds to a market share of 23.5 % of total passenger volume (2,768 Million passengers). According to OAG data, they operated 5.8 Million flights in 2010, while the total number of flights performed in 2010 was 30.6 Million. The global network is made up of 76.5 Thousand routes, and LCCs serve altogether 16.4 Thousand routes.

In an almost linear development, LCC travel volume has grown from 160 Million passengers carried in 2002 to 650 Million in 2010; on average annually by 60 Million passengers. While in 2010 altogether 94 LCCs transported the total volume, there were only about 40 LCCs in the year 2002 to serve the demand. **North America and Europe are the regions with the highest low cost traffic**, with 200 Million passengers in North America and 240 Million in Europe, however, the growth has come to a halt in North America and has slowed down in Europe since 2007. The other regions have much lower low cost traffic volumes, their growth, however, is still unrestrained. LCCs had started earlier to develop networks in Europe and in particular the United States, and it seems that these networks have reached sizes and densities which make it more and more difficult for LCCs to add new economically viable routes and frequencies, again particularly in the United States, where the number of passengers has been stable since the year 2007.

Because of the relatively stronger LCC growth the **market share** increased from about 8 % in 2002 to 24 % in 2010. It seems that the world LCC share proceeds towards a saturation level somewhere in the range of 25 to 30 %, although in some regions and countries this level may be significantly higher, as can be seen in South America, Europe and Australia. The developments of LCC and total passenger volume and of LCC market share have been elaborated for each of the world regions. As can be expected, each region has its own development pattern, ranging from slow growth in the beginning, due to the building-up process of LCC services, to strong growth towards the end of the period, over linear growth over the whole period to decreasing growth in almost saturated markets with stagnation towards the end of the period.

Passenger volumes of LCCs have grown much faster than the total volume; the number of LCC passengers grew on average by 19.2 % from 2002 to 2010. The **number of flights** offered has also grown faster, on average by 15.1 % annually. In low cost travel, like in FSNC travel, flight efficiency in terms of passengers per flight has gained over time by 3.4 % annually. In addition, flight efficiency of LCCs is higher than of FSNCs; as compared with the total, LCCs have carried 22 % more passengers per flight in 2010. The **networks of LCCs** have been developed much faster than those of FSNCs. The number of routes of LCCs has grown globally from 2.3 Thousand in 2000 to 16.5 Thousand in 2010, on average by 21.8 %

per year. The network extension of LCCs has thus grown a bit faster than the demand for travelling on these routes.

The development of the market share of LCCs follows some kind of S-shaped sigmoid curve. Market maturity seems to be one important factor, and the competitive situation of LCCs plays an important role as well. In order to structure and classify observed patterns of development of LCC market share in world regions we have employed **a binary logit model**. As the comparison between the actual and the modeled development of market shares shows, the model fit and explanatory power of the model is sufficient for reaching a generally good approximation, however, the model needs still improvements in some markets.

The development over time of LCC traffic and total air traffic in world regions suggests a similar model treatment for each of these segments, since finally all traffic developments follow some kind of a logistic function. It seems that in relatively young markets as in Asia and the Middle East the traffic growth follows the S-curve on the lower part whereas in more saturated markets as in North America and Europe traffic growth has passed already these high growth phases of the general growth function and is approaching the slow growth part or even the final stagnation part. It is intended to model these region specific markets as well, however, with more complex functions and more region specific variables.

We know from route specific passenger statistics that **LCCs typically attract substantial new demand** when opening new low fare services. We have shown on a series of LCC routes in Germany and Europe the total generation effect of new LCC services on the demand by looking at the development of demand before and after the introduction of new LCC services. There have been numerous examples where the effect on demand was in the order of more than 10,000 passengers per month attracted to the new LCC services. Secondly, the impact occurs immediately after the introduction of new services and lasts only for a short time, say a few months; the development of demand follows then the former trend. More routes in other world regions have been analysed with similar results; demand reactions have been strong and occurred immediately. We may conclude therefore that the introduction of LCC services generate substantial new demand. The effect is following immediately and the demand follows then on the higher level the former development trend, in developing markets the demand grows faster than in the past. The demand generation of LCCs depends thus on the opening of new routes, a step that becomes more and more difficult to realize as in developed networks most sustainable routes are already served by one or more LCCs.

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Annex

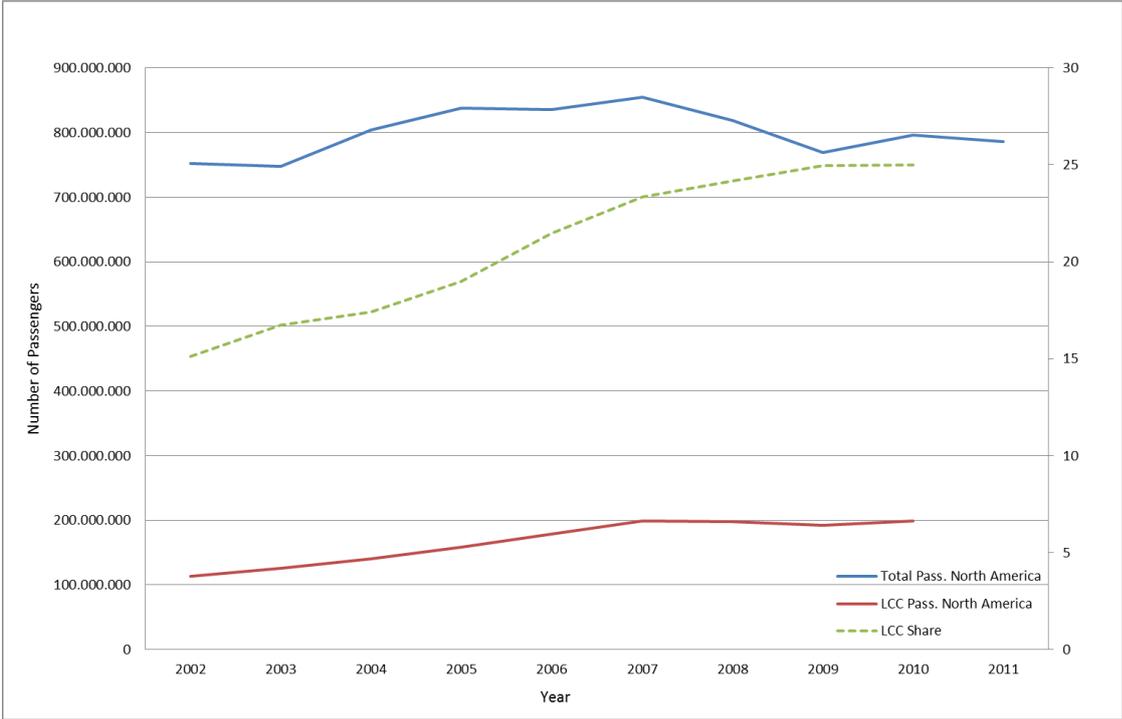


Fig. A1: Development of LCC and Total Air Traffic (Passenger Volume) and LCC Market Share in North America, 2002-2010; (Source: Sabre ADI, DLR)

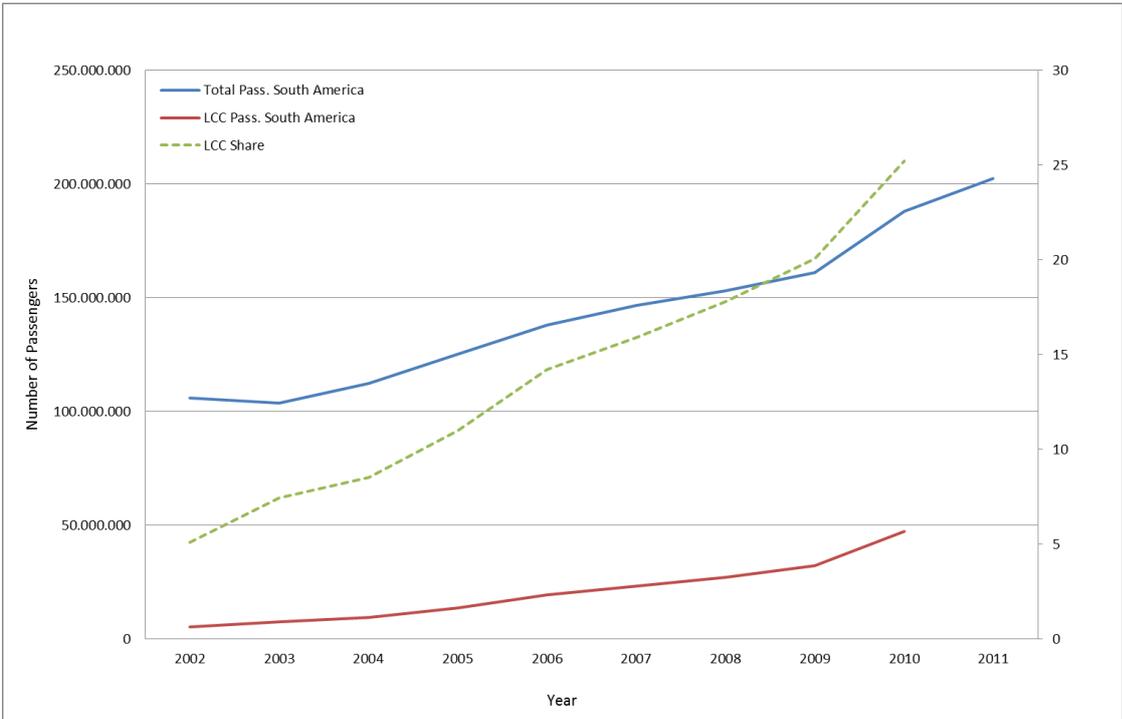


Fig. A2: Development of LCC and Total Air Traffic (Passenger Volume) and LCC Market Share in South America, 2002-2010; (Source: Sabre ADI, DLR)

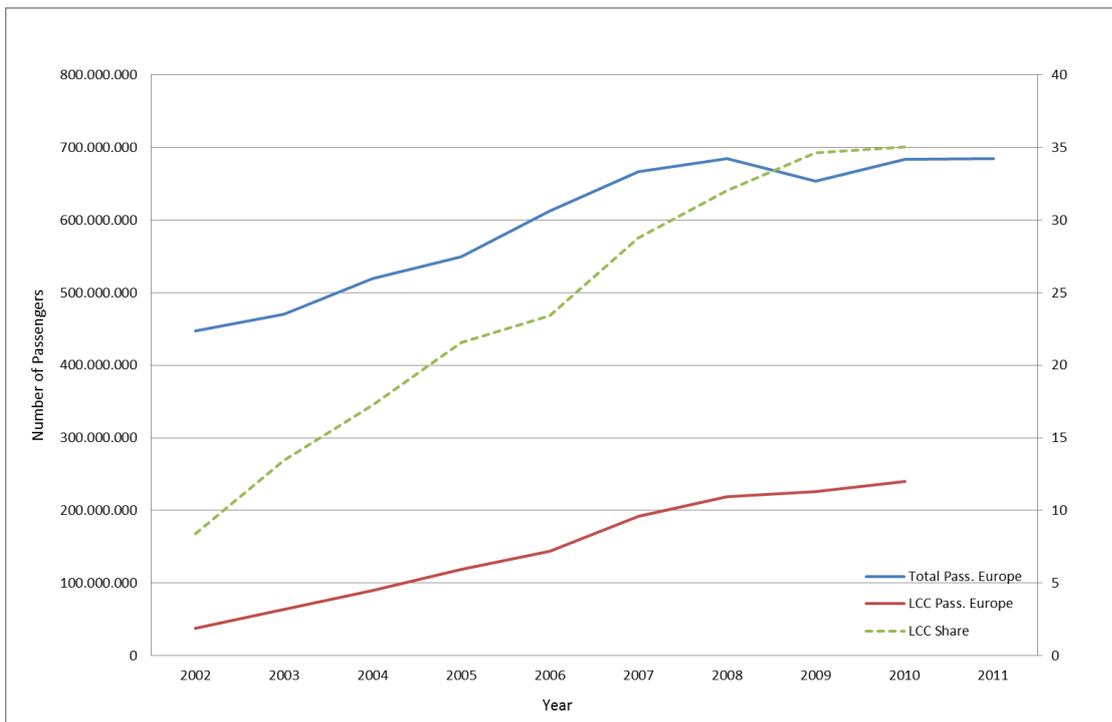


Fig. A3: Development of LCC and Total Air Traffic (Passenger Volume) and LCC Market Share in Europe, 2002-2010; (Source: Sabre ADI, DLR)

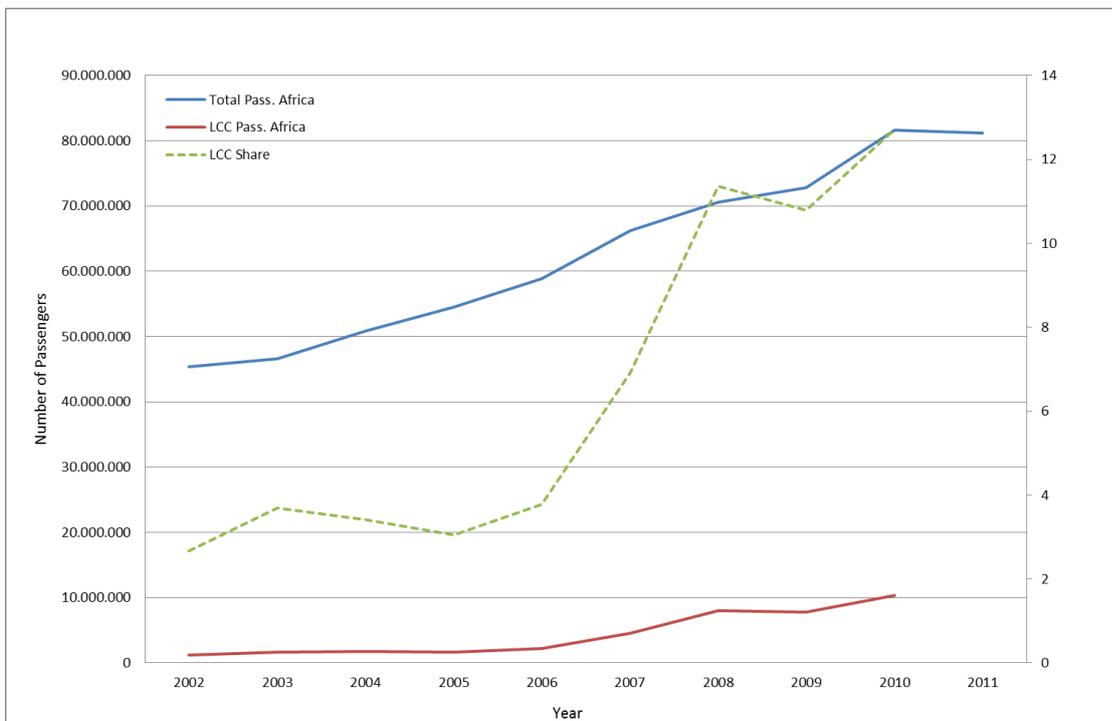


Fig. A4: Development of LCC and Total Air Traffic (Passenger Volume) and LCC Market Share in Africa, 2002-2010; (Source: Sabre ADI, DLR)

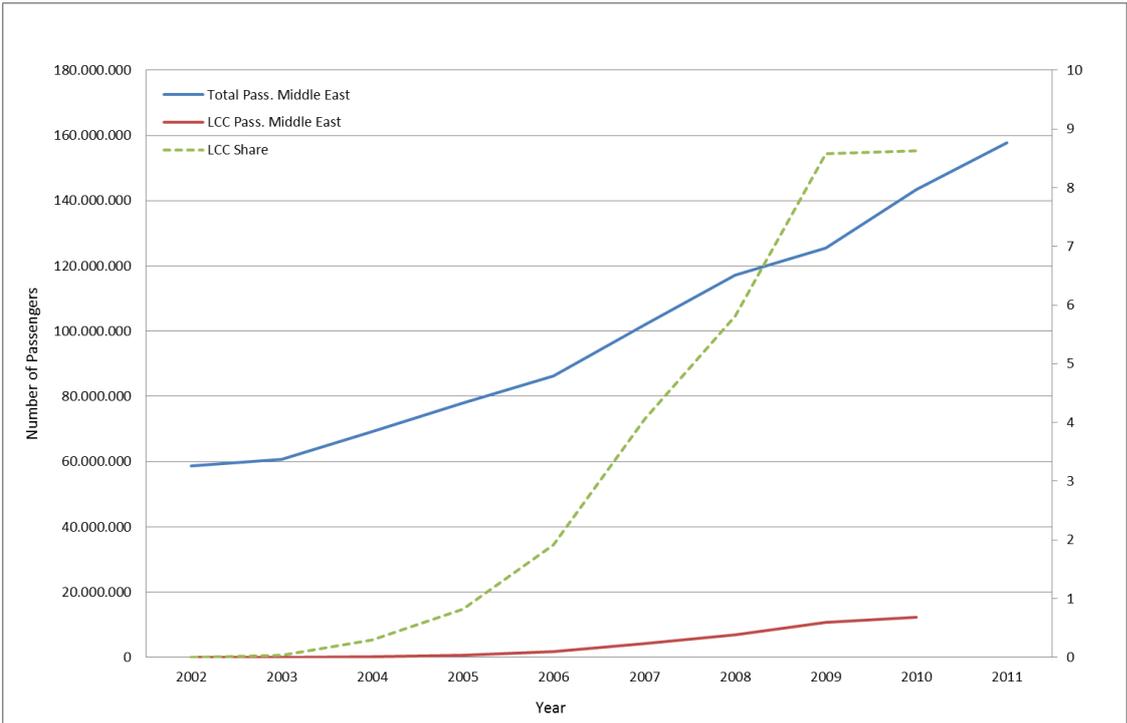


Fig. A5: Development of LCC and Total Air Traffic (Passenger Volume) and LCC Market Share in Middle East, 2002-2010; (Source: Sabre ADI, DLR)

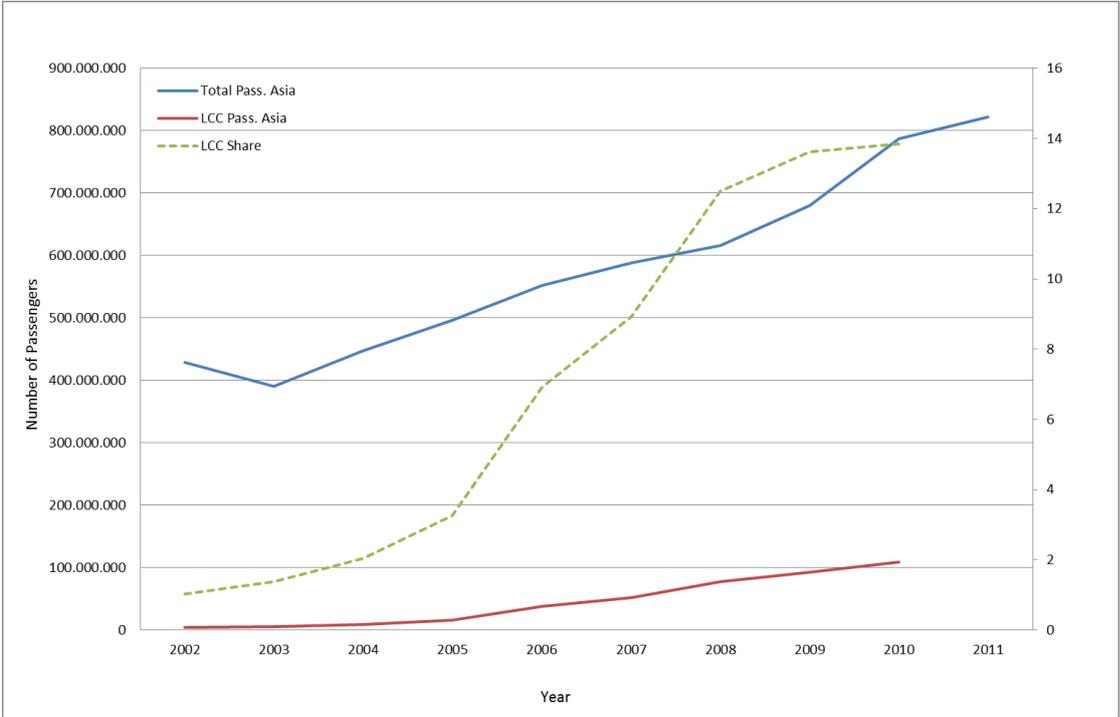


Fig. A6: Development of LCC and Total Air Traffic (Passenger Volume) and LCC Market Share in Asia, 2002-2010; (Source: Sabre ADI, DLR)

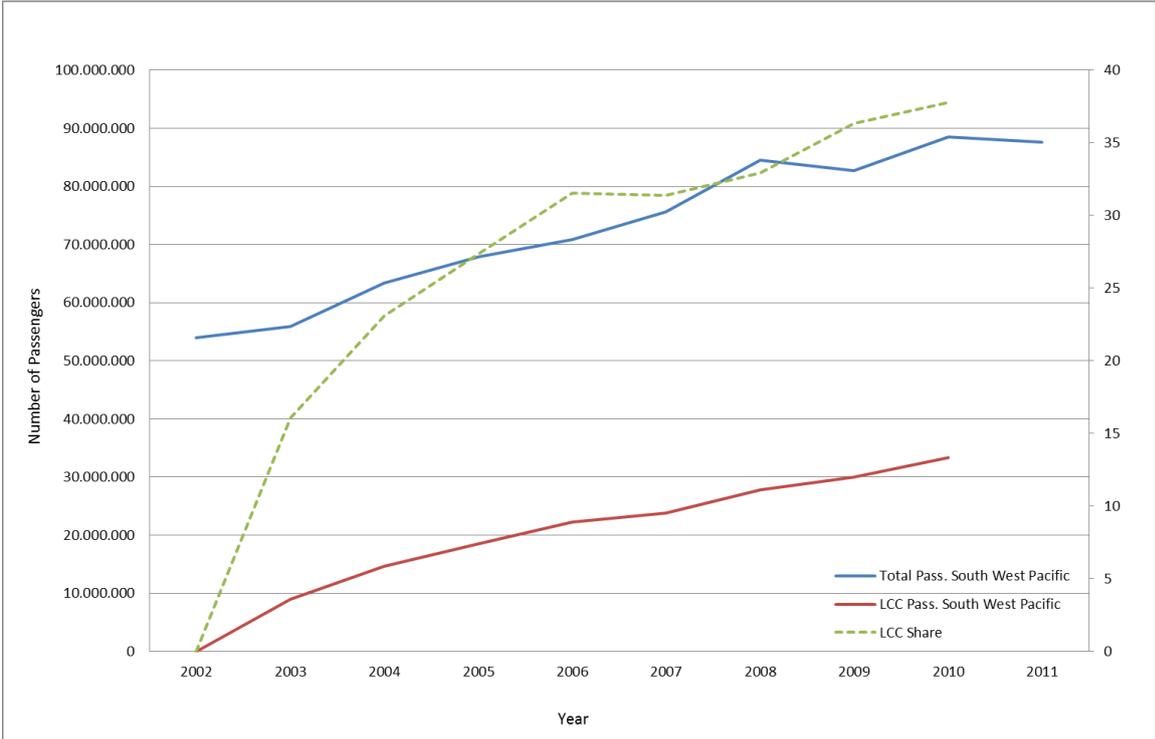


Fig. A7: Development of LCC and Total Air Traffic (Passenger Volume) and LCC Market Share in South West Pacific, 2002-2010; (Source: Sabre ADI, DLR)