EUROPEAN UNION-LATIN AMERICA/CARIBBEAN AIR TRANSPORT CONNECTIVITY AND COMPETITIVENESS IN DIFFERENT AIR POLICY CONTEXTS

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Abstract

This paper discusses the factors that affect network connectivity and competitiveness in the European Union and Latin America/Caribbean air transport market. The methodology is based on detailed real origin and destination data that allow the calculation of levels of market concentration and segmentation, airport connectivity and network efficiency. The bilateral markets analyzed compare unfavourably with other inter-continental markets, even though the economic growth of the countries involved would suggest otherwise. The market is dominated by a small number of airports and airlines, and connectivity in several Latin American and Caribbean states is over-dependent on tourism. Geographic factors can partially explain the situation identified, while the impact of policy, especially as regards the fragmented moves towards liberalization, is also discussed.

Keywords: Latin America, Caribbean, European Union, air transport, airport competition, network efficiency, connectivity

1. Introduction

The European Union (EU) is one of the most connected and competitive air transport regions in the world. With an average of more than 30 thousand daily commercial flight movements, connecting more than 2,100 airports , to domestic, intra-EU, intra-European and intercontinental points (Eurocontrol Network, 2019). Nevertheless, the EU to Latin America/Caribbean market is among the least developed of all major regional destinations from/to Europe, representing only a 5% share of the EU's international passenger traffic. The picture for air cargo is similar, with only about 6.5% of extra-EU airfreight activity corresponding to this region.

The number of monthly Available Seat Kilometres (ASKs) to the Latin America/Caribbean region represented only 7% of total ASKs from Europe in December 2015 and in comparison to the previous year grew by only 1% versus an average growth of 3.7% to other world regions (FlightGlobal, 2015). Perhaps more significant in terms of European competitiveness, average capacity growth in December 2015 from other world regions to Latin America/Caribbean was almost 17%. These trends imply that growth in the bilateral passenger and freight activities is slow, even though economic growth and improved market conditions in most of Central and South America would suggest otherwise. This effect is accompanied by increasing air transport market concentration and the formation of hub-and-spoke networks that dominate the specific market.

The research question addressed in this paper is whether this bilateral market has specific conditions that limit growth, connectivity and competition. The approach is based on transport geography criteria, focusing on the network and market segmentation characteristics that affect the level and spatial distribution of air transport activity. The temporal dimension is also considered, with the analysis covering the period 2002 to 2016. As an under-researched inter-continental air transport market, a tentative hypothesis can be set as follows: Network and market segmentation characteristics affect the level and spatial distribution of air transport activity within the EU-LAC inter-continental market using air transport connectivity as a proxy of 'air transport activity'.

The paper is set out as follows. Section 2 contains a review of general literature on air transport connectivity and competitiveness as well as a discussion of studies specifically

relating to the Latin American/Caribbean market. Section 3 outlines the methodology employed in the study to give a fair assessment of EU-Latin America/Caribbean competitiveness and connectivity along with the method used to appraise the impact of current and potential air policies on these markets. Sections 4 and 5 detail the market and policy results and findings respectively and Section 6 draws key implications and conclusions from the study. The Appendices include supporting information on the correspondence of airport codes and on the definitions of the freedoms of the air (see Appendix 2).

2. Review of air transport connectivity and competitiveness literature

While air passenger traffic continued to grow rapidly during the last 20 years at a global level and air transport networks became denser due to new direct connections (point-to-point and hub and spoke), the role of hub airports has remained strong and has even strengthened in terms of long distance connections (Wong et al., 2019). There is a growing interest in transport geography research on international air transport networks and flows, as well as on their interdependence with connectivity and competitiveness.

2.1. Factors affecting the evolution of international air transport networks

Air transport connectivity can be measured with a variety of methods and measures (Burghouwt and Redondi, 2013), often through an appropriate connectivity indicator (e.g. scale-based measure, access, frequency etc.) depending on the scope of the analysis. In most cases, research addresses specific aviation markets within a geographic zone (Wang et al., 2011). Zhang et al. (2017a) applied the NetScan model on data for 69 Chinese airports in the period 2005-2016, identifying a significant correlation between levels of competition and connectivity. Chang et al. (2020) compared the connectivity levels of ten major Asian airports and identified the cases where geography gives a competitive advantage for hubs serving specific international markets. For Australian regional airports, Zhang et al. (2017b) identified that size of the population and income levels were the main drivers for increasing airport connectivity.

Concerning evidence on the drivers of the expansion of non-historical aviation markets, Koo et al. (2017) explored the role of tourism in increasing aviation activity for 'peripheral' inter-regional markets, focusing on the Korea-Australia market. Zhu et al. (2019) analysed the

China-Australia market between 2005 and 2016. While Sydney maintained its role as the main gateway on the Australian side, Guangzhou emerged as a new point of direct connectivity indicating that geographic and underlying economic factors help determine the major hubs that go on to serve and dominate in these markets. A comparison of the evolution of connectivity between the EU and four international markets (Morocco, US, Turkey and Russia) (Christidis, 2016) detected significant differences in network efficiency among the four bilateral markets.

The development of hubs is also an issue of high research interest. The importance of the hub airport city and the type of aircraft used airlines serving hubs can determine the number of connections available at the hub (O'Connor and Fuellhart, 2016). Dai et al. (2018) note a strengthening of the main hubs despite an increase in direct connections at the regional level in the Southeast Asia market. Using a complex network approach, they described the evolution of air transport from 1979 to 2012 and identified the observed developments through a multi-layered structure. In an example from Europe, Suau-Sanchez et al. (2016) elaborate on the importance of the high volume of trans-Atlantic connections that allows London Heathrow airport to maintain its role as a main hub in Europe, despite increasing competition from other hub airports across Europe.

The importance of indirect connections and connecting traffic through hub airports were encapsulated through the connection quality weighting approaches of Veldhuis, 1997., Burghout and de Wit, 2005 and Allrogen et al., in 2015. The latter study broadened out earlier research into an expended Global Connectivity Index (GCI), showing that non-stop connectivity actually reduced in North America and Europe between 1990 and 2012 and only improved at Asian airport during this period, despite aggregate level connectivity (inclusive of indirect connections) improving across all observed regions.

2.2. Airline strategies and air transport policy

Airline strategy can shape the structure of intra and inter-continental markets. Meichsner et al. (2018) examined the role of Ethiopian airlines in the African air transport network and identified three main factors for the airline's success: a large intra-African network, scheduled connections and strategic partnerships with regional carriers. This observed strength of Ethiopian Airlines has helped to give Addis Ababa a stronger continental market presence than it may otherwise have had.

Airline alliances often appear as a determinant of network development. In the EU to USA air transport market, Pels (2009) highlighted the trend for airlines to form alliances in order to protect their competitive position and strengthen their role of the own main hubs to serve the Trans-Atlantic market. Based on econometric modelling, Bilotkach and Hüschelrath (2019) suggested that the formation of alliances in the EU to USA market improved connectivity on one hand, but resulted in a higher degree of market concentration on the other. Zhang et al. (2019) also highlight the importance of alliance formation in the trans-Atlantic market as the main means for market entry and for the avoidance of connectivity overlaps. In the absence of these alliances, levels of direct connectivity would clearly have been higher, albeit with a higher level of duplication. Moreover, the concentration of flights into major hubs may not have been as prevalent. Grosche et al. (2017) applied connectivity indicators in order to describe the trends in hub competition between European and Middle East/ Gulf airports in the long distance air transport market, and identified the geographic and operational advantages of the individual hubs.

A large number of studies explored the relationship between air transport policy and airline competition. Despite the different methods and measures used, most research strongly supports the idea that progress towards the deregulation and liberalisation of air transport markets leads to at least some competitive effects whether it be in relation to average fares, capacity offered, frequencies or service levels. For the internal EU market, liberalization had a clear positive impact on air transport activity and connectivity, benefitting travellers with more choices and lower fares (Dobruszkes, 2009). Following an extensive review of air transport liberalization worldwide, Fu and Oum (2014) argued that open markets facilitate the optimization of airline networks and lead to higher efficiency for the airline industry, but also distorts demand patterns for airports due to higher levels of uncertainty. Njoya et al. (2018) evaluated the progress of liberalization in the EU- Africa market and identified a positive correlation impact of market openness on passenger volumes and fare reductions. The positive impact of international agreements that open up bilateral markets was confirmed by Abate and Christidis (2020a). Nevertheless, while the number of passengers increased and average fares decreased, there was no observable effect on frequency or the number of new connections.

Government support for airlines and airports has been historically important for the development of national and international air transport markets. The negative impact of the

Covid-19 pandemic on aviation meant that governments worldwide needed to step in and provide support to airlines registered in their countries. The vast differences in the criteria used and the type of government support among countries may lead to imbalances in competition and may, in the short to medium term, cause further concentration in favour of large airlines and hubs (Abate et al., 2020b).

2.3. Research on Latin America and the Caribbean air transport markets

Evidence focussed specifically on the Latin America and Caribbean region is scarce, with the limited research to date indicating that progress towards open-skies has been slower and more fragmented. Warnock-Smith and Morrell (2008) examined three US-Northern Caribbean markets and concluded that there was a positive statistical relationship between air policy reform and traffic/capacity growth, with flexibility towards carrier entry leading to greater output and competition levels. The number of effective competitors and Low-Cost Carriers (LCC) entry was greater in markets with lower entry barriers (e.g. US-Bahamas). The inverse was observed for the US-Jamaica market between 1995 and 2003 when limited designation reform coincided with more modest entry and traffic levels. O'Connell et al., (2020) point out that there are 45 different bilateral and multilateral traffic right and ownership provisions for a population of 580 million inhabitants in Latin America, whereas markets with a comparable population (e.g. the United States or Europe) have a single directive. Latin American carriers have tried to circumvent these regulatory barriers by consolidating through franchising.

The long term trends in Argentina between 1972 and 2019 reveal that the high volatility in local economic conditions and the changing context in aviation competition and operational models had mixed effects (Keeling, 2020). While new national routes appeared, in some cases operated by LCCs, the international market grew mainly towards Brazil and other Latin American countries. The US and European markets from Argentina grew relatively slower during the period, indicating that geography can be a factor for both economic interaction and air transport network development. Analyzing the trends in the Brazilian market after deregulation (2000- 2010), Oliveira et al. (2016) identified a persisting trend for traffic concentration. Fernandes et al. (2019) confirmed those findings in an analysis of the period 2007-2016. While airports located in the peripheral regions of Brazil experienced significant growth in terms of connections and passengers, the main airports in the three main cities

(Rio de Janeiro, Sao Paulo and Belo Horizonte) strengthened their role as regional and international hubs further. In Panama, COPA airlines adapted its business model to the location of its hub airport (O'Connell et al., 2020). Using a predominantly narrow-body aircraft fleet, the airline maximized the density of its network connections to serve traffic between South America and Central/ North America.

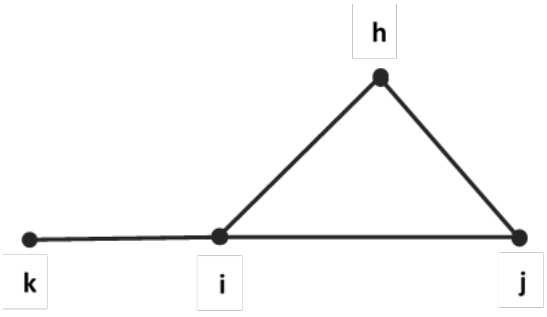
3. Methodological outline

The approach followed here in order to discuss the evolution of connectivity and competition in the specific market employs a number of suitable indicators based on reliable data at flight, airport and airline level. The evolution of the descriptive statistics and indicators over time and across markets provides useful insights that may explain the particular issues related to Latin America and the Caribbean.

As a first source of data, information on operations and financial results of flights serving the EU-Latin America/ Caribbean were collected and aggregated (CAPA, 2018). These data allowed the calculation of the passenger activity and average fares for each airline in order for an initial assessment of the market conditions to be possible.

The second source of data used here corresponds to highly detailed information at flight origin-destination (OD) level for the period 2002-2016 (Sabre). The use of OD level data has the advantage of including possible flight connection required between the departure airport and the airport at the final destination. The data from the Sabre dataset include the number of passengers, the average fare and the flight distance for any OD and airline combination. Data are directional, at current prices and without taxes or airport charges.

Apart from the use of aggregate data, the approach followed here uses a number of additional indicators that reflect the structure of the air transport network:



- Airport market concentration: a measure of the dispersion of the real final destinations from a real origin i. The indicator is a formulation of the well-known Herfindahl-Hirschman Index (HHI) and is calculated as the sum of the squares of the share of each final destination with respect to total passengers from i. A value of 1 indicates a concentration of the market share to a single destination, while a value close to zero corresponds to a wide distribution among a large number of destinations each having a comparable share.

$$HHI_i = \sum_j \left(\frac{\sum_j (pass_{ij} + \sum_h pass_{ihj})}{\sum_{ij} (pass_{ij} + \sum_h pass_{ihj})}\right)^2 \quad \text{(Eq.1)}$$

where $pass_{ij}$ is the number of passenger flying directly between i and all final destinations j,

and $pass_{ihj}$ the number of passengers flying from i to any final destination j with a connection in any airport h

- Airport connectivity indicators: the ratios of local, behind, beyond and bridge passengers passing through an airport i. 'Local' corresponds to the share of passengers with i as the real origin and j as the real destination, without intermediate connections:

$$con\_local_i = \frac{\sum_j pass_{ij}}{\sum_j (pass_{ij} + \sum_h pass_{ihj} + \sum_k pass_{kij} + \sum_{hk} pass_{kihj})} \quad \text{(Eq.2)}$$

'Beyond' corresponds to the share of passengers with origin i, connecting at an intermediate airport h before continuing on to any final destination j:

$$con\_beyond_i = \frac{\sum_{jh} pass_{ijh}}{\sum_h (pass_{ih} + \sum_j pass_{ijh} + \sum_k pass_{kij} + \sum_{kj} pass_{kihj})} \quad \text{(Eq.3)}$$

'Behind' refers to passengers with any origin k, connecting at airport i before continuing on to a final destination j:

$$con\_behind_i = \frac{\sum_{jk} pass_{kij}}{\sum_j (pass_{ij} + \sum_h pass_{ihj} + \sum_k pass_{kij} + \sum_{kh} pass_{kihj})} \quad \text{(Eq.4)}$$

For trips requiring more than one connections, 'bridge' refers to passengers with any origin k, making a first connection at airport i, a second connection at an airport h, and a final destination at an airport j:

$$con\_bridge_i = \frac{\sum_{kjh} pass_{kihj}}{\sum_h (pass_{ih} + \sum_j pass_{ijh} + \sum_k pass_{kij} + \sum_{kj} pass_{kihj})} \quad \text{(Eq.5)}$$

Airports acting as a national or regional hub tend to have a high 'behind' ratio, while airports that need a connection through a hub tend to have a high beyond 'ratio'. Major international hubs usually combine non-zero 'behind', 'beyond' and 'local' ratios.

- Network efficiency indicator: the share of passengers using direct flights between real origin i and any real final destination j compared to total passengers between i and j (including passengers using connections through any airport h):

$$neff_i = \frac{\sum_j pass_{ij}}{\sum_j (pass_{ij} + \sum_h pass_{ihj})} \quad \text{(Eq.6)}$$

where $pass_{ij}$ are the passengers between i and each final destination j, and $pass_{ihj}$ the passengers between i and each final destination j though any connecting airport h. The network efficiency indicator quantifies the share of an airport's passenger demand served by direct flights and can be used as a benchmark for the evaluation of the direct coverage of its flight network.

Finally, an exploratory scenario analysis of a potential change on the policy side was performed. The scenario assumed the extension of EU-3rd country horizontal type agreements to additional Latin American/Caribbean countries following the format of the EU-Brazil (2011) and EU-Chile (2005) agreements. The possible impact of a more comprehensive policy shift across the region to horizontal type agreements was calculated using the difference between changes in traffic of a control pair of countries and those observed in EU-Brazil and EU-Chile markets. This difference was converted into a percentage annual growth estimate for the region above and beyond those already observed in the intervening 2002-2016 period. The level of openness was measured using

the World Trade Organisation's Air Liberalisation Index (ALI), itself based on ICAO's World Air Service Agreement (WASA) database.

4. Indicators of competiveness and network connectivity

4.1 Overall market trends

The trends in the EU-Latin American/Caribbean passenger market from 2002 to 2016 (Figure 1) suggest that activity has been growing, but with several fluctuations over the 15 year period, the result of economic and political crises in Latin American countries. The global economic conditions in 2003 and 2012-2013 decreased air transport demand in most countries in the area. Political and economic instability in Argentina, Brazil and Venezuela prevented the recovery of the local markets after 2013. It is also evident that the market is highly dispersed, with only a single country –Brazil- presenting a sizeable share of the total traffic to the EU.

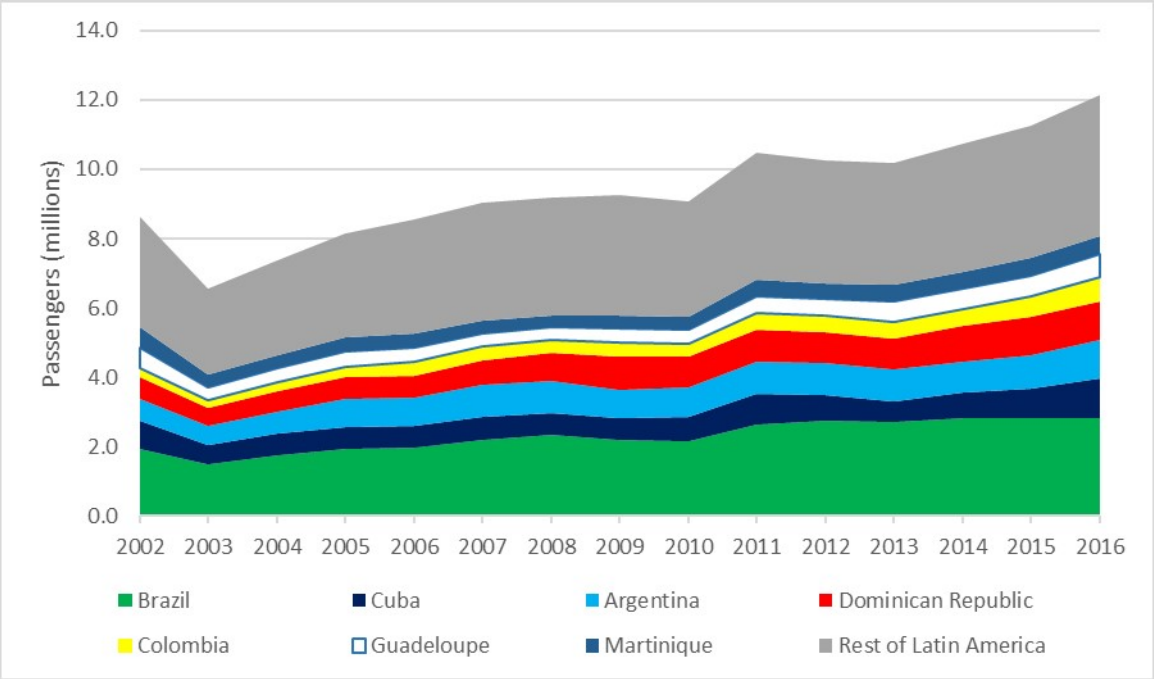


Figure 1: Air passengers to the EU by main Latin America/ Caribbean country (millions, directional). Source: Sabre

Table 1 shows that there has been downward pressure on air fares - consistent with global trends - as more players and capacity have entered the market. This 6% reduction in fares along with other socio-economic and demographic factors driving demand, have

contributed to a 41% increase in traffic over the period. With growth in traffic outpacing reductions in fares, the apparent increased price elasticity has led to higher overall revenues in EU-Latin America/Caribbean markets. Total revenue increased 32% over the 2002-2016 period to around US$8.5bn. Nevertheless, growth in the specific market was slower than in the other regional markets for Latin America and the Caribbean (Appendix 3). Even though fares decreased for all regional markets at comparable degrees after 2011, the European market was the one with the lowest rate of growth. In contrast, the North American market grew by 33.3%, with a decrease in average fares of only 7.5%.

Table 1: Overall market change EU-Latin America between 2002 and 2016

Market indicator	**2002**	**2016**	**% change**	**% change per year**
O&D passengers (000)	8,649	12,164	41	2.9
Average fare (US$)	741	696	-6	-0.4
Total revenue generated (US$ 000)	6,412,230	8,462,488	32	2.3

Source: Sabre

Table 2 highlights the top-20 routes by traffic in 2016. Interestingly the top 2 markets are actually intra-EU markets with Pointe-a-Pitre, Guadeloupe (PTP) and Fort-de-France, Martinique (FDF) both being overseas departments of France. Citizens of both islands as well as visitors from France benefited from low average fares and high frequencies possibly because of the strong cultural, demographic and economic links between metropolitan France and the two French overseas islands. If these two pairs are excluded then Madrid (MAD) to Buenos Aires (EZE) was the biggest O&D market in 2016. A common characteristic of this and the remaining top 10 O&D pairs between the EU and Latin America/Caribbean is the presence of strong colonial, language and cultural links. Latin American points namely Buenos Aires, Argentina (EZE); Bogota, Colombia (BOG); Lima, Peru; Havana, Cuba (HAV); Santiago, Chile and Santo Domingo, Dominican Republic (SDQ) focus EU bound traffic

through Madrid whilst Cayenne, French Guyana (CAY), Paramaribo, Suriname (PBM) and Curacao (CUR) both have high levels of traffic to/from Paris (ORY) and Amsterdam (AMS) respectively. Bridgetown Barbados (BGI) to London Gatwick (LGW) would also feature in this category.

The other key factor in some cases seems to be the development of tourism, which can cut across or compliment traditional historical ties with ongoing leisure opportunities mainly for European holidaymakers bound for the warmer Caribbean areas of the Americas. Examples of this in the top 20 are Madrid (MAD)-Havana (HAV), Paris (CDG)-Havana (HAV) and Frankfurt (FRA)-Sao Paolo (GRU). Some developed tourism resorts in Latin America/Caribbean have started to attract high numbers of passengers from non-traditional European source countries. Punta Cana, Dominican Republic (PUJ)-Paris (CDG) in 2016 with 98,000 passengers each way (not in the top 20 but growing from only 67,000 passengers in 2002)

Table 2: Top 20 routes EU-Latin America in 2016

EU airport		Latin America Airport				
Airport	**City**	**Airport**	**City**	**Passengers (each way)**	**Flights/ year (each way)**	**Distance (km)**
ORY	Paris	PTP	Pointe-a-Pitre (Guadeloupe)	572,035	1,622	6,792
ORY	Paris	FDF	Fort de France (Martinique)	491,525	1,442	6,887
MAD	Madrid	EZE	Buenos Aires	378,060	1,397	10,153
MAD	Madrid	GRU	Sao Paulo	336,844	1,265	8,428
MAD	Madrid	BOG	Bogota	321,595	1,304	8,055
MAD	Madrid	LIM	Lima	305,426	1,204	9,573
CDG	Paris	GRU	Sao Paulo	287,232	1,027	9,476
MAD	Madrid	HAV	Havana	273,436	965	7,480
FRA	Frankfurt	GRU	Sao Paulo	227,896	726	9,861
MAD	Madrid	SCL	Santiago (Chile)	225,317	884	10,778
LHR	London	GRU	Sao Paulo	209,827	729	9,522
CDG	Paris	HAV	Havana	208,726	543	7,783
LGW	London	BGI	Bridgetown (Barbados)	206,997	807	6,788
MAD	Madrid	SDQ	Santo Domingo	180,696	766	6,698
AMS	Amsterdam	CUR	Curacao	165,401	619	7,875
CDG	Paris	GIG	Rio de Janeiro	153,500	547	9,267

ORY	Paris	CAY	Cayenne (French Guiana)	142,389	553	7,135
LIS	Lisbon	GRU	Sao Paulo	141,741	622	8,000
FCO	Rome	EZE	Buenos Aires	136,088	550	11,226
AMS	Amsterdam	LIM	Lima	132,753	366	10,591

Source: Sabre, see Appendix 1 for airport code key

When comparison 2002 with 2016, the net result of these developments as shown in Figures 2 and 3 is a higher number of traditional route and country pairs along with a higher number of non-historical pairs, catering for new and emerging leisure and other tourist opportunities (e.g. London to Havana and London to Dominican Republic – Punta Cana).

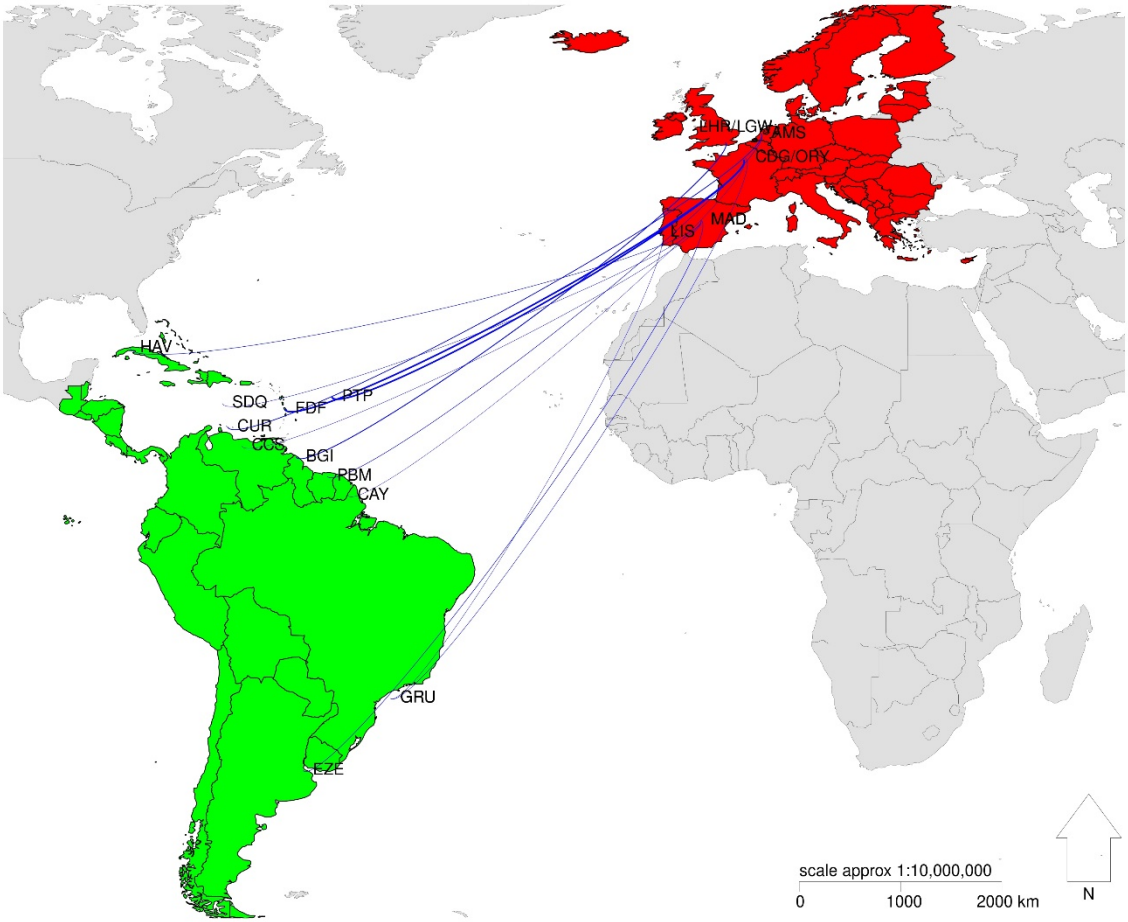


Figure 2: Europe – Latin America route pairs 2002

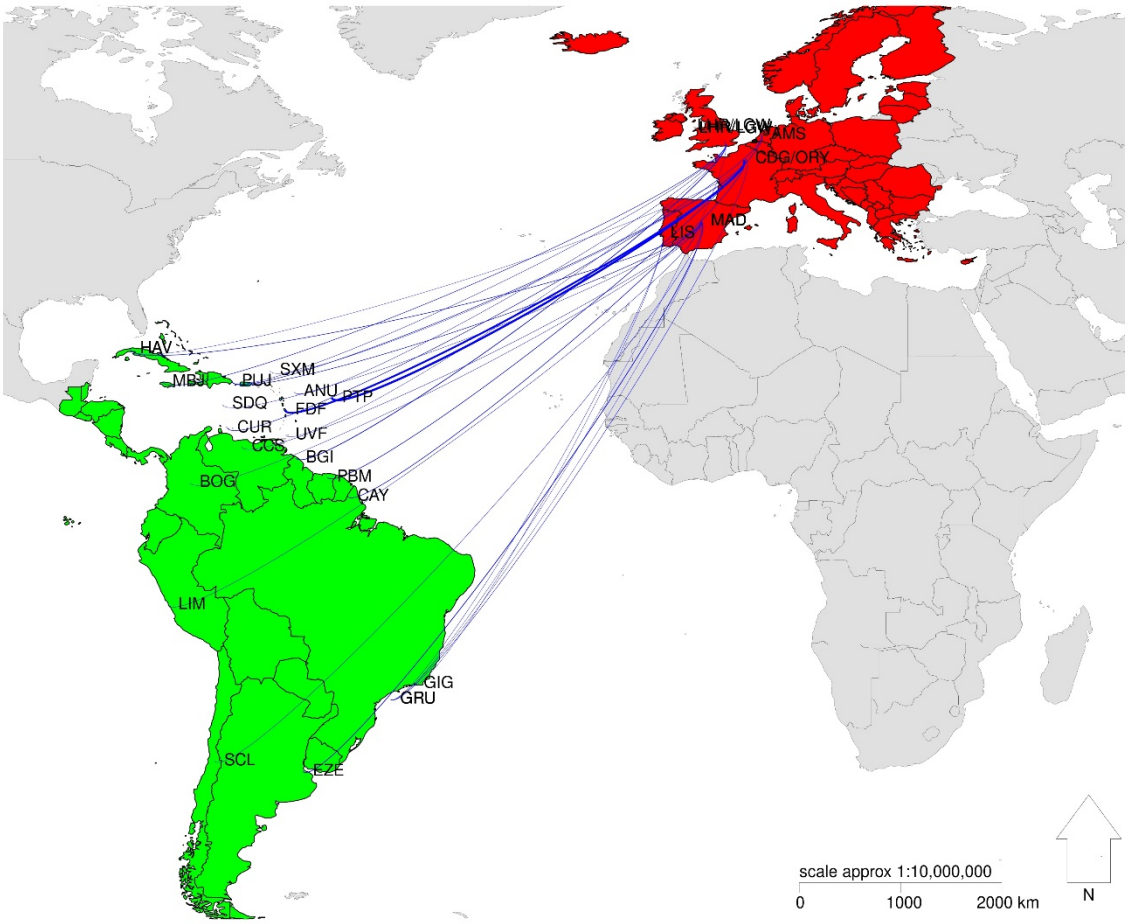


Figure 3: Europe – Latin America route pairs 2016

It is worth highlighting the low average fares on the HAV-MAD market, which dropped from US$327 in 2002 to US$179 in 2016 (Sabre). This assisted in increasing traffic numbers to around 273,000 in 2016, rising to eighth place amongst the top 20. In line with the aggregate statistics shown in Table 1 all top 20 pairs with the exception of Barbados (BGI)-London (LGW) and Curacao (CUR)-Amsterdam (AMS) saw traffic volume increases over the 2002 to 2016 period.

The Brazil- Portugal market is –surprisingly- does not feature prominently among the largest EU-Latin America/Caribbean markets (Table 2), even though the strong cultural, colonial and

historical ties between these two countries would suggest otherwise. In 2016 the largest city-pairs were Sao Paolo-Lisbon (around 142,000 passengers each way - in the top 20) and Rio De Janeiro-Lisbon (around 123,000 passengers each way). The relative weakness of Lisbon as an intercontinental gateway in comparison to Madrid, London, Frankfurt and Amsterdam means that significant numbers of Brazilians and to a lesser extent Portuguese citizens are presented with sometimes cheaper fare options by making connections through alternative European hubs, even though there have been direct, non-stop frequencies between major Brazilian points and Lisbon.

It is also possible to see how levels of competitiveness have developed on selected Latin America/Caribbean–Europe pairs during the period 2011 to 2017[1] (Table 3). In three of the five pairs the total number of seats have increased, in two cases significantly. In these cases, inbound tourism into the Spanish speaking Caribbean has been the main driver of this growth. In both markets, the number of players gaining entry has more than doubled and the resulting HHI index indicates a more competitive situation. When fare data from Sabre is cross-referenced it becomes clear that these changes in market dynamics have put downward pressure on fares, thereby creating additional demand in these markets. In 2002, for instance, the average return fares were US$481 and US$343 on PUJ-MAD and PUJ-CDG respectively, whereas in 2016 they reduced to US$255 and US$207. A similar picture has materialised on Havana, Cuba–Western European pairs.

[1] Source data for this only goes back to 2011.

Table 3: Number of market entrants on selected EU-Latin America markets 2011-2017

Origin	Destination	No. of players Sep 2011	No. of players Sep 2017	No. of seats 2011 (Sep 19-25)	No. of seats 2017 (Sep 18-24)	HHI index 2011	HHI index 2017
Havana	Western Europe	6	14	6,374	14,559	0.202	0.136
Punta Cana	Western Europe	7	15	4,920	13,051	0.211	0.081
Buenos Aires	Western Europe	7	8	20,135	23,362	0.175	0.149
Barbados	Western Europe	3	3	5,501	4,151	0.484	0.468
Sao Paolo	Western Europe	11	11	36,496	35,884	0.139	0.178

Source: CAPA (2018) Assumptions: Direct services only and no cross-owned airlines

On the two markets that saw reduced capacity, the number of market entrants and the HHI index has stayed largely the same. Again, if Sabre average fare data are cross-referenced, there has actually been an increase in average fares in most city-pairs over the period. By way of example, GRU-LIS and GRU-FRA saw average return fares increase from US$506 to $561 in the case of GRU-LIS (2002 and 2016) and from US$764 to $815 in the case of GRU-FRA. TAM (now LATAM), TAP and Air France between them had a 58% market share in 2016 despite there being 11 players operating routes from GRU to Western European destinations. This strong position among the three players would have prevented the market from oversupplied capacity and fare decreases. For the Buenos Aires–Western Europe markets, variation is also as expected, with a small increase in the number of entrants, seat capacity and the HHI index airline competitiveness over the 2011 to 2017 period.

4.2 Hubs and network efficiency

In terms of connectivity levels, Figures 4 to 7 show how the major gateways have changed and developed over the 15 observed years. In Latin America/ Caribbean total demand, as depicted by bubble sizes, have increased but perhaps more pertinent is that the number of observed gateways with connections to European points, which have increased from 20 in the South American continent in 2002 to 29 in 2016 with the number of secondary points in Brazil, Argentina and Colombia increasing and connecting flights also starting from Paraguay. The Caribbean has remained largely static over the period with larger than average proportions of local and beyond traffic. Perhaps most striking has been the appearance of Central American points as connecting points to Europe in their own right with sizeable bubbles developing in Panama, Costa Rica and El Salvador.

These developments can be partly explained by the consolidation and strengthening of local Latin American carriers over the period and their incorporation into global strategic alliances. This has certainly been the case with Avianca, TACA (now the same company), LATAM Airlines Group, formerly LAN based in Chile and TAM Airlines based in Brazil after merging in 2012 and Copa Airlines, based in Panama and a vibrant member of the Star Alliance since June 2012.

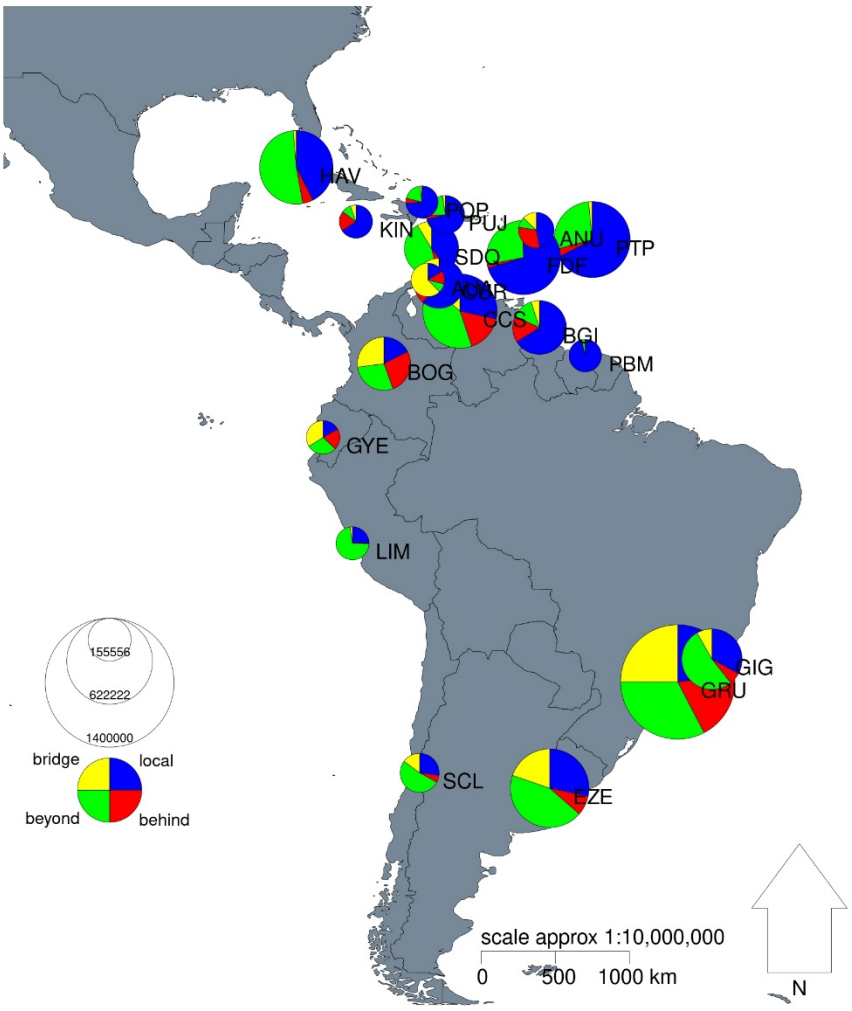


Figure 4: Latin America and Caribbean to Europe connectivity 2002

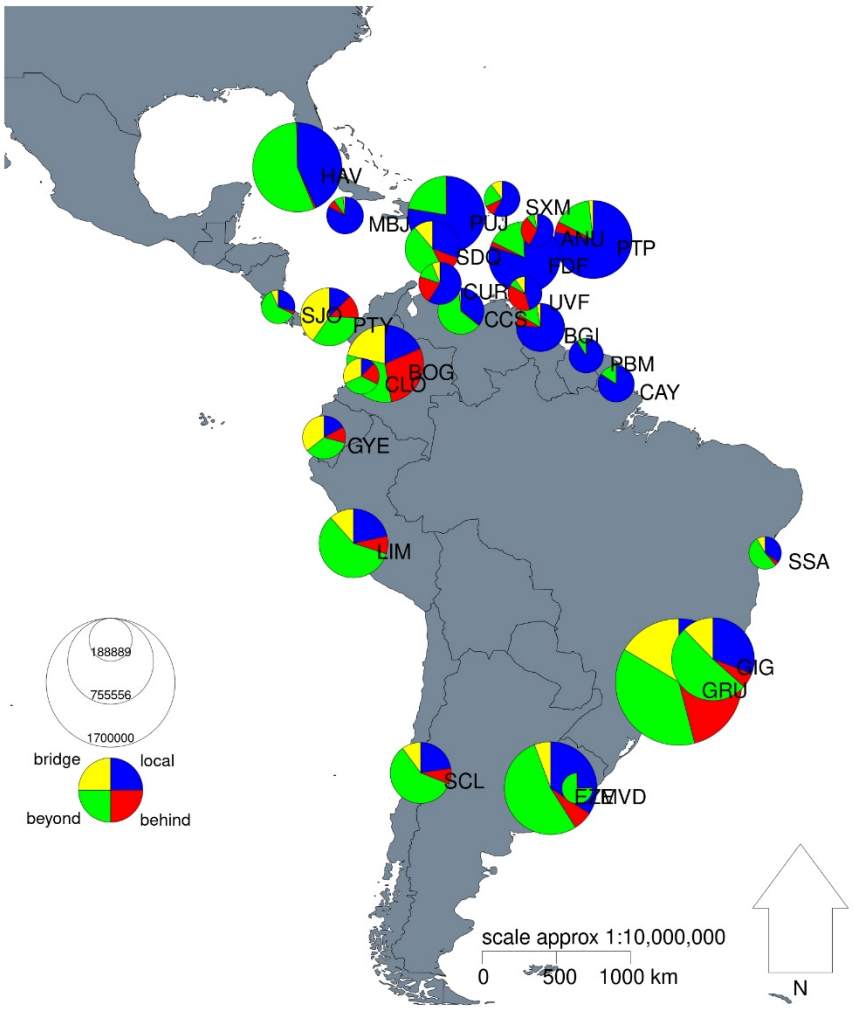


Figure 5: Latin America and Caribbean to Europe connectivity 2016

Over the entire period the main Latin American flows were channelled into a handful of main hubs in Spain, the UK, France, the Netherlands, Germany and to a lesser extent Italy and Portugal with LGW and ORY seeing the largest proportion of point-to-point routes and local traffic (Figures 6 and 7). If anything this trend has intensified with secondary points in France and Germany primarily focussed on local traffic effectively disappearing – swallowed up by primary hub airports and their mainline network carriers seeking out further scale economies and co-operative growth. As carriers in Europe continue to 'catch up' in the consolidation race with their US and Latin American counterparts, this trend is only set to intensify further unless counterbalanced at the same or a faster rate by expanded long-haul

low cost services to/from Latin America and the Caribbean. The biggest European beneficiary over the 2002 to 2016 period was Madrid, Spain due to IAG consolidation in Europe, which has given operators like Iberia more of a free reign to expand uninterrupted into Latin America; and also the strengthening of privatised and larger scale, mainly Spanish speaking, Latin American carriers wishing to offer an increasing number of flights into Europe. By 2016 MAD was acting as the major transit hub for Latin American points with 1.9 million passengers making connections through MAD, almost twice as much as the next largest transit hub for EU-Latin America/Caribbean traffic; that of Paris CDG with 1mn passengers.

The role of air carrier consolidation in the channelling of traffic into major hubs has also been discussed with this phenomenon happening both in Latin America and in Europe with the net effect in Europe particularly being an intensification of connecting traffic into a smaller handful of European hubs. In Latin America/Caribbean more secondary gateways have started to open up to direct and connecting traffic but with the overall network efficiency decreasing. Despite the consolidation process there, Latin America and the Caribbean is much more spread out geographically than Europe leading to a greater need for additional airport gateways.

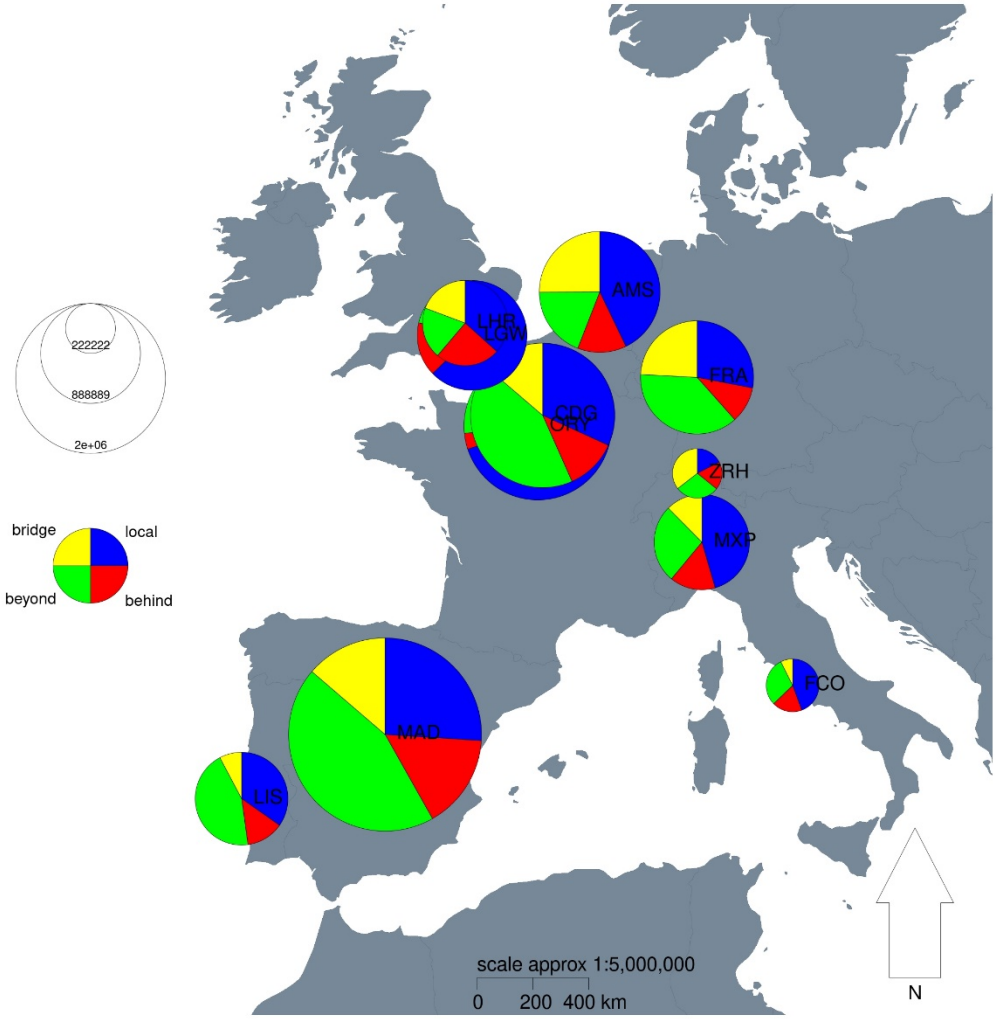


Figure 6: Europe from Latin America connectivity 2002

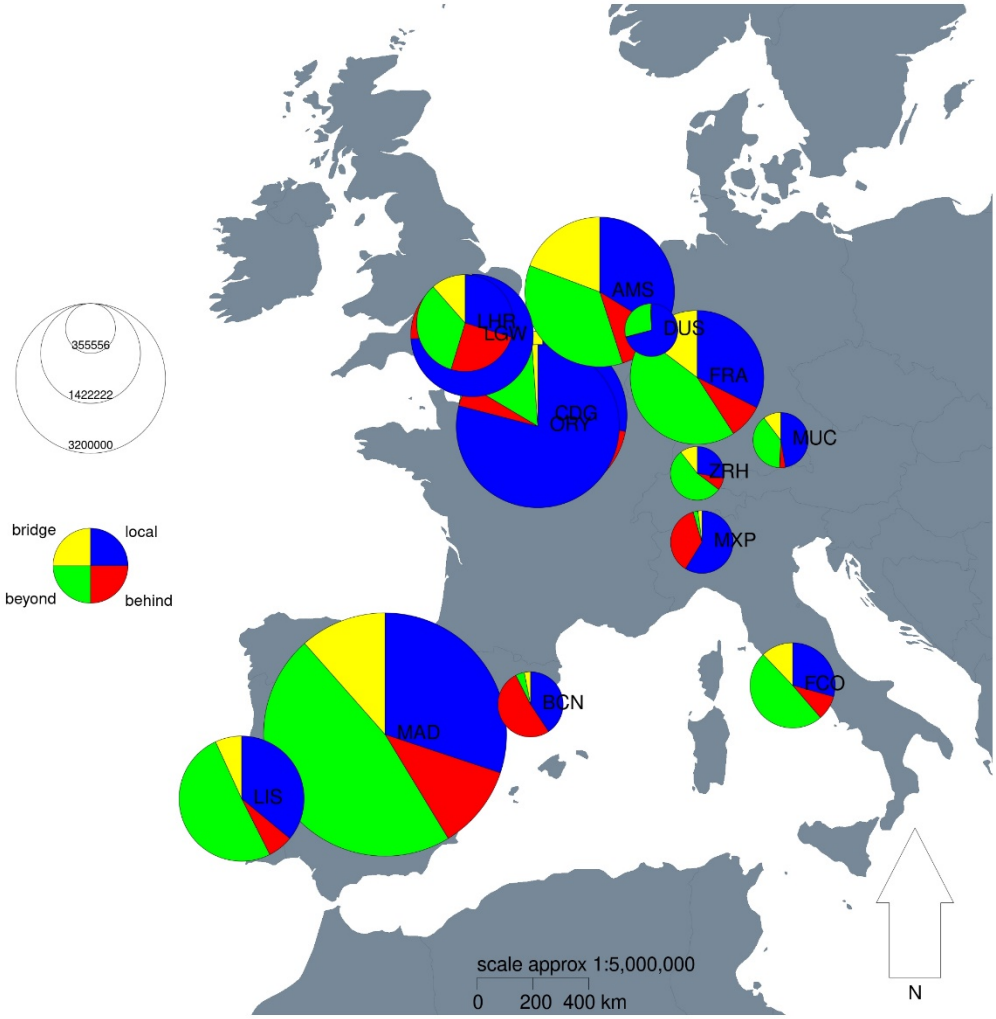


Figure 7: Europe from Latin America connectivity 2016

Figure 8: Ratio between network efficiency indicator and total EU-LA/Caribbean traffic

Network efficiency, as calculated by Equation 6, has actually decreased from a high of 62% in 2003 to a lower peak of 49% in 2011 to a low of 41% in 2016 (Figure 8), despite the greater number of Latin America/ Caribbean airports with direct flights to Europe. A possible explanation is that the additional direct routes stimulated an even larger number of indirect connections through the same hubs.

Physical distance has a strong contribution to the low network efficiency and the limited number of direct connections between the EU and Latin America/ Caribbean. Given the Trans-Atlantic nature of the connections, the range of aircraft capable of serving such connections is limited to wide-body/ long-range airplanes. The data from the average aircraft passenger capacity of existing flights in the specific market demonstrate a strong correlation between flight distance and aircraft size (Figure 9). The currently used options are typically A330, A340, A350, Boeing 777, Boeing 787, and the larger A380 and Boeing 747, all corresponding to high price models that require a high capital investment (which in itself is a limiting factor for market entrance). The use of such aircraft is commercially viable

only in high capacity connections, which are possible in only a limited number of airport pairs. If existing flights are used as an indicator for commercial viability, the data from existing connections between the EU and Latin America/ Caribbean show that annual traffic per route should be about 50 thousand passengers each way for a link to be viable, while intra-continental routes within Europe have a median of about 30 thousand.

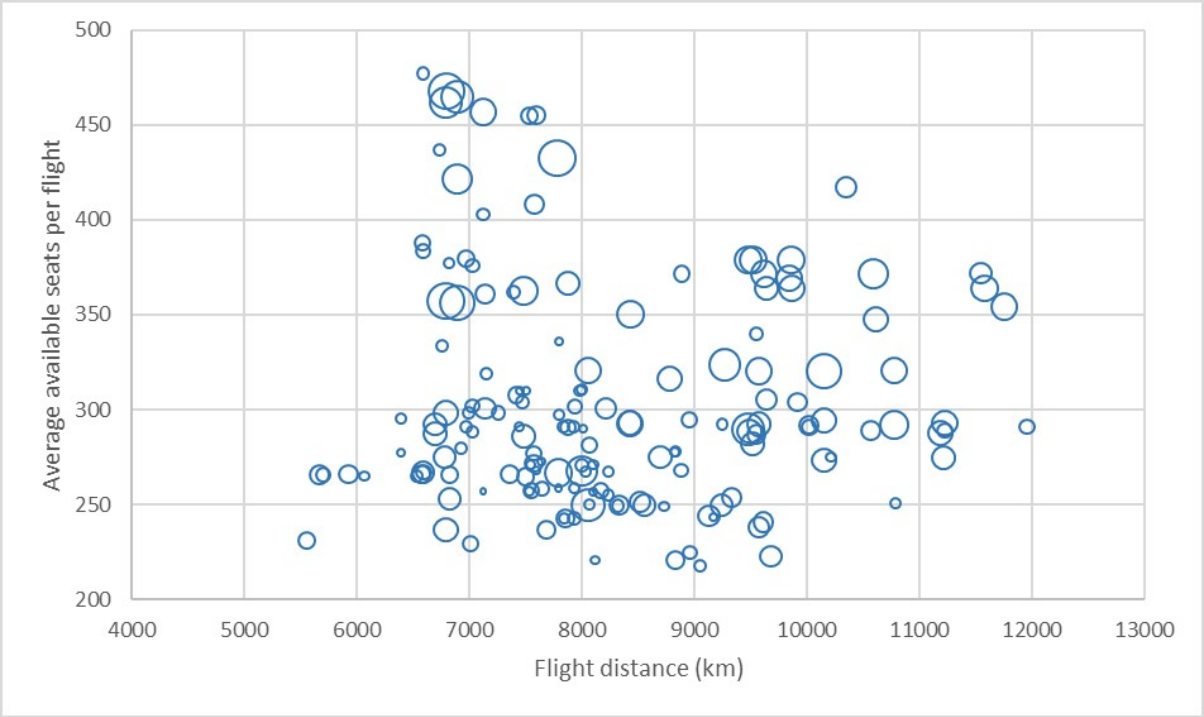


Figure 9: Correlation between flight distance, aircraft size and passenger traffic, 2016

Using HHI as a measure of traffic dispersion between airports and the network efficiency ratio, distinguishing between direct versus indirect traffic, it was possible to see if there was any pattern emerging between the level of hub airport dominance (on the European side) and the extent of direct traffic flows. Figure 10 shows the results for 31 Latin American/Caribbean airports for year 2016. Three main clusters with different levels of market concentration and network efficiency can be identified:

- *Cluster A: Specialized destination, diversified market.* Cancún, Varadero and Punta Cana serve major, mass-market touristic destinations that attract visitors from across the EU. The distribution of air passengers to/from Europe has a low concentration (HHI< 0.4) which is served efficiently (more than 70% of demand is served by direct

flights). The demand for the touristic product of all three destinations is quite sensitive to cost and is mostly concentrated in European airports from where direct flights are available (as opposed to using additional connections that would increase the total travel cost and/or time). Airlines opt for direct, often low cost or chartered flights, from a range of European airports that ensure the critical mass of holiday-makers at least during seasonal peaks (normally during the European winter).

- *Cluster B: Specialized destination, specialized market*. Airports in this group correspond to small islands/ countries that combine a high dependence on tourism and a small number of markets on the European side. Both hub dominance and network efficiency are high, reflecting a large number of direct flights, a low amount of connecting traffic and most traffic flowing to only one or a low number of airports. This makes sense for countries like Suriname given the state's population concentration in Paramaribo and its historically closer links to the Netherlands in Europe than other parts of Latin America or Europe. The same goes for independent island states with highly developed cultural links with only one European state and only one airport gateway for intercontinental flights.
- *Cluster C: Diversified destination, diversified market*. Most Latin America airports and a few diversified Caribbean ones offer a wider range of connections with Europe and, as a result, enjoy less concentrated markets. The main characteristic of most of the airports in this group is that they also serve as national or regional gateways for air travel of their residents to Europe (as opposed to the predominantly opposite direction for the other two clusters). Within this group, there is significant variation as regards network efficiency. Santiago de Chile is an example of a gateway that has a low European airport HHI and a low network efficiency indicator throughout the observed period including in 2016. This shows that its main airport gateway, Santiago, benefits from a dispersed range of points in Europe (not just Spain) and a high degree of connecting traffic from the Latin American side but not enough to increase the ratio of direct to indirect services. LATAM with its hub in Santiago benefits from channelling traffic on Latin America feeder services, further preventing the opportunity, in what is a consolidated airline market (through franchising), for further direct, point-to-point services from other European airports.

The comparison of the characteristics of the three clusters provides some useful observations from a transport geography point of view. The demand for passenger air transport depends on the capacity to attract visitors or to generate trips, which in turn are the consequence of numerous geographic and socio-economic factors. The destinations in Cluster A are specialized touristic destinations, with limited outgoing traffic. Since their touristic infrastructure allows a high volume of visitors and they can attract a critical mass of visitors from a variety of European countries, these destinations develop a disperse network of direct connections that are normally high-volume and low cost. The number of connecting passengers through these European airports is limited, since the resulting total fares for the passengers would make these touristic destinations economically unattractive. In contrast, airports in Cluster B maintain high network efficiency levels because of the narrow focus of their demand base. While in some cases they are a touristic destination too, most have only a few connections with European airports, which serve particular market segments (overseas territories of European countries or highly concentrated immigrant populations). Airports in clusters A and B are over-dependent on a specific economic activity or a specific geographic area respectively, a fact that may potentially limit growth in demand and cause a risk for their future evolution.

Cluster C includes airports with a more balanced mix of market segments. Given the price sensitivity of demand for long distance flights and the different rates of economic development, these airports attract more visitors from Europe than in the opposite direction, either for tourism or business purposes. Still though, most of these airports are not able to maintain direct flights to a wide range of European airports that can provide the critical mass of passengers. As a result, although they enjoy a wide geographic distribution of demand to/ from Europe, only a small share of air passenger activity is served through direct flights.

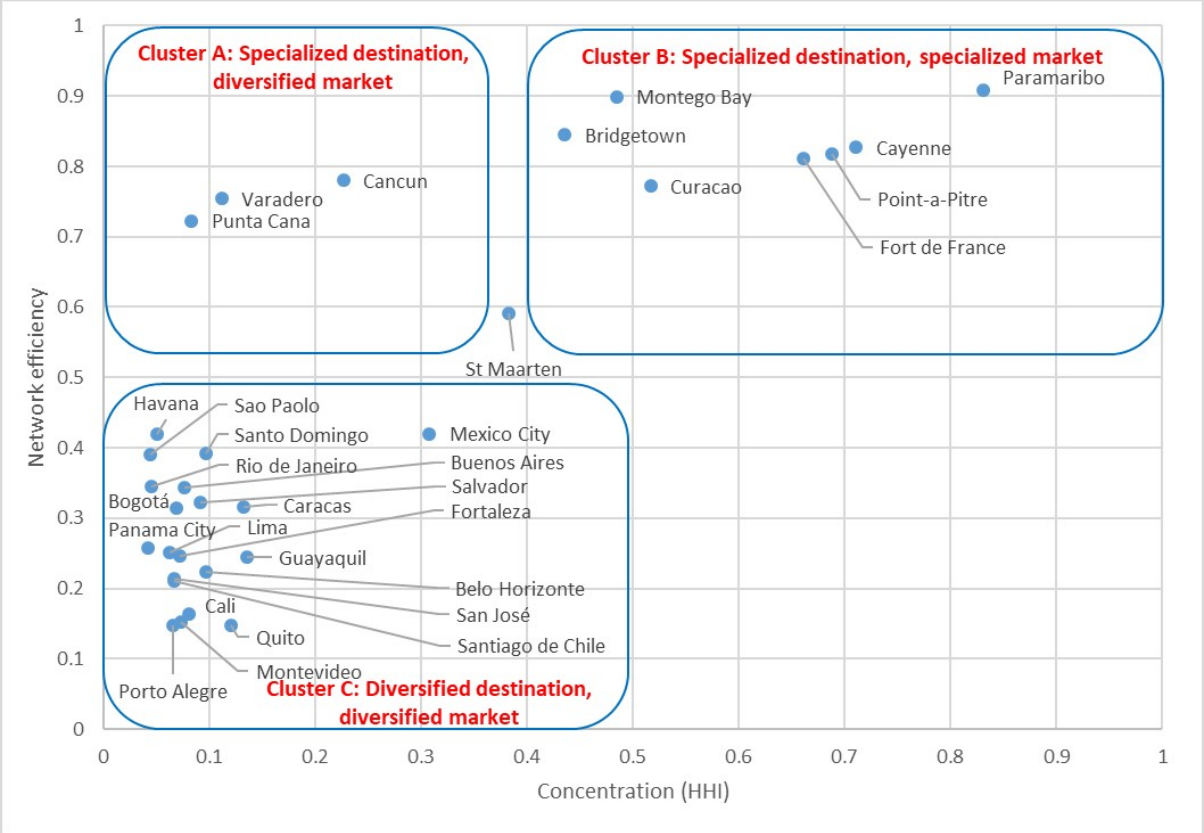


Figure 10: Airport market concentration (to/from Euro airports) and network efficiency 2016

4.3 Market liberalization

The commercial air service regulations between Latin American/Caribbean and European states are based on pre-existing Bilateral Air Service Agreements (BASAs) with the exception of Brazil (key strategic partner since 2011) and Chile (Horizontal agreement since 2005). These bilateral agreements are in most cases rather restrictive, permitting only 3rd and 4th freedom rights to a limited number of designated carriers and points (e.g. Brazil-Sweden before 2011). Only a few exceptions have provisions for 5th, 6th and 7th freedom traffic rights with the removal of any capacity and fare restrictions, as is the case with the Antigua and Barbuda-UK agreement, for example (Table 4).

The ICAO World Air Service Agreement (WASA) database has been compiled into an Air Liberalisation Index (ALI) by the World Trade Organisation[2]. Revised bilateral agreements that generally contain at least 5th freedom traffic rights, multiple designation, free pricing

[2] Details of the Air Service Agreement Projector Air Liberalisation Index methodology can be found here https://www.wto.org/asap/resource/data/html/methodology_e.htm

and determination of capacity with some allowance for cooperative arrangements typically receive between 30 and 36 points out of a possible 50 on the standard ALI. As can be seen in Table 4, very few Latin America/Caribbean-Europe ASAs were considered very liberal in 2011 with the average index number being only 16.

Table 4: Average level of Air Service Agreement (ASA) liberalness

LATAM/Caribbean Country	EU countries	Standard ALI (Average)
Antigua and Barbuda	UK	38
Argentina	Spain, Netherlands, Italy, UK, Greece, Denmark, Austria, Sweden, Germany, Czech Republic	13
Belize	Austria	4
Barbados	UK, Netherlands, Denmark, Sweden, Belgium, Luxemburg	7
Bolivia	Spain, Germany	8
Brazil	Portugal, France, Spain, UK, Germany, Netherlands, Belgium, Sweden, Denmark, Austria, Hungary	9
Chile	France, Spain, UK, Germany, Netherlands, Sweden, Denmark, Belgium	15
Colombia	France, Spain, UK, Germany, Netherlands, Belgium, Portugal, Italy	15
Costa Rica	Spain, Netherlands, Belgium	14
Cuba	Spain, UK, Germany, Netherlands, Austria, Belgium, Sweden, Poland, Portugal, Hungary, Czech Republic	8
Dominican Republic	France, Spain, UK, Germany, Netherlands, Austria, Italy	13
Ecuador	France, Spain, Germany, Netherlands,	10
El Salvador	Spain	13
Grenada	UK	26
Guatemala	France, Spain, Germany, Netherlands, Belgium, Switzerland	11
Guyana	France	6
Jamaica	UK, Germany, Netherlands, Sweden, Norway, Switzerland, Belgium, Denmark, Hungary	8
Mexico	Spain, France, UK, Germany, Italy, Swiss, Belgium, Netherlands, Poland, Czech Republic, Denmark, Portugal, Austria	8
Netherlands Antilles	UK	6
Nicaragua	Spain	10
Panama	UK, Germany, Netherlands, Switzerland, Belgium, Spain	16

Paraguay	Germany, Netherlands, Switzerland, Belgium, Spain	11
Peru	Spain, France, UK, Germany, Switzerland, Sweden, Norway	11
St. Lucia	UK	12
Venezuela	Spain, Portugal, France, Netherlands	11
LATAM/Carib Region average	**Europe**	**16**

Source: WTO ASAP (2011), Note: Standard ALI maximum liberalisation level = 50

Since 2011 it is likely that further revisions to existing ASAs or new liberal agreements/MoUs have been signed between states, but the overall picture is undoubtedly piecemeal and fragmented with carriers often having to seek traffic rights and 'ad hoc' revisions to ASAs before new route expansions take place. A replication of the EU-Chile and EU-Brazil multilateral agreements across other EU and Latin America/Caribbean country-pairs would certainly create a more liberal and open market but is unlikely to take place given the lack of political, cultural and historical integration between different parts of Latin America and the Caribbean.

To provide an indication of the possible traffic gains that could be made through the signing of a more comprehensive multilateral agreement with the European Union, traffic developments over the observed period were noted for both Chile and Brazil along with couple of control countries that continued with their existing, more restrictive bilateral agreements throughout the same period (Table 5).

Table 5: Possible traffic effect of EU-Latin America/Caribbean multilateral policy stimulus

	ALI	Brazil-EU	ALI	Argentina-EU
Before policy stimulus average change in annual passenger traffic	9	66,432 (2002-2011)		
After policy stimulus average change in annual passenger traffic	30	117, 020 (2012-2015)*	13	24,970 (2002-2016)
	ALI	**Chile-EU**	**ALI**	**Colombia-EU**
Before policy stimulus average change in annual passenger traffic	15	-11,330 (2002-2005)		
After policy stimulus average change in annual passenger traffic	30	16,721 (2006-2016)	15	20,417 (2002-2016)

*In 2016 annual EU-Brazil passenger traffic took an uncharacteristic dip from 2.3mn to 2.1mn in part due to external political issues taking place in Brazil starting in late 2015. Given 2016 was an outlier in the data post-multilateral agreement change was calculated for the period 2002-2015 for EU-Brazil.
ALI Notes: EU-Chile Horizontal agreement signed in 2005 and assumes an ALI of 30. An ALI average of 15 is used up to and including 2005 to reflect preceding bilateral agreements Chile had with a more limited number of EU states. EU-Brazil Key Strategic agreement signed in 2011 assumes an ALI of 30. An ALI average of 9 is used up to and including 2011 to reflect preceding bilateral agreements Brazil had with a more limited number of EU states.

The observed before and after change in annual passenger traffic on EU-Chile markets was 28,051, whilst on EU-Brazil markets it was 50,588. In percentage terms, this represents an estimated 2% increase in traffic in the case of Brazil and 6% in the case of Chile-EU markets. There are obviously too few data points to allow for a generalization of the findings, but a range of 2-6% could be used as a conservative reference point.

Looking into specific bilateral examples, recent moves have been made by countries such as Panama, the Dominican Republic and some other Caribbean states with European states that are keen to see an increase in choice for European holiday-makers. In the case of Antigua and Barbuda, permitting a community carrier principle and 5^{th}-7^{th} Freedom rights within its UK ASA was important, given that carriers such as British Airways and Virgin Atlantic typically prefer triangular routes into and out of Antigua and Barbuda in order to increase load factors on their long-haul flights. The Dominican Republic was also able to sign a liberal agreement with the UK in 2006, which has since led to traffic levels of around 80,000 in 2016 up from only 3,500 in 2002. On the PUJ-LGW route alone, there were around 68,000 passengers in 2016.

Some liberalised agreements have tended not to lead to big gains in traffic due to the lack of underlying trading demand between states. This has been the case with Chile-Switzerland, Norway and Sweden whom agreed liberal arrangements between 2001 and 2004 but only witnessed modest increases in traffic (e.g. Chile-Switzerland saw 14,233 passengers in 2002 and 19,034 in 2016), though as discussed this was superseded anyway by a more comprehensive horizontal agreement between Chile and the whole of the EU/EEA.

The impact of the lack of a comprehensive, multilateral and liberal ASA policy was found not to overly impede traffic developments in the observed period as infancy markets have been able to use existing bilateral agreement or revisions to such agreements to expand and grow.

These observations agree with the assessment of the air transport liberalization process in Latin America as being 'lukewarm' (Vega, 2017). The relatively low traffic levels of existing direct connections and the lack of commercial interest for new routes may partially explain why few new competitors are interested in this specific market. In addition, the established role of the existing main hubs on both sides of the Atlantic acts as a disincentive for operators and governments to seek agreements granting 5^{th} to 7^{th} freedoms. The three main global airline alliances have established networks that effectively allow the connectivity that those freedoms would bring and most operators seem to be comfortable in this situation. An outcome of the maintenance of this type of limited competition framework is the formation of an oligopoly, in which the top 10 airlines (out of a total of 73 operating) in the EU to Latin America/ Caribbean market carried 70% of the total number of passengers in 2016 (Table 6). This is a broadly similar outcome to other intercontinental markets with the top 10 airlines on the Europe to China market, for example, occupying 68% of the total market in 2019 (Sabre).

The exceptions to the stagnation of the liberalization process appear to be driven by concerted policy actions for which air transport policy is only one element, as in the case of Cuba or the Dominican Republic and their strategy of promoting the tourism industry as a whole.

Table 6: Top 10 airlines in the EU to Latin America/ Caribbean market, 2016

Airline	Country	Passengers (millions)	Number of departures	Average seats per flight	Market share (%)
Air France	France	1.58	5,527	359	14.5
Iberia	Spain	1.1	4,234	305	10.1
KLM	Netherlands	0.9	2,968	344	7.9
Air Europa	Spain	0.8	3,002	307	7
TAP Portugal	Portugal	0.7	3,448	267	6.6
British Airways	United Kingdom	0.7	3,115	257	6
LATAM Brasil	Brazil	0.6	1,846	347	5
Air Caraïbes	France	0.5	1,594	356	4.7
Lufthansa	Germany	0.5	1,734	325	4.2
Avianca	Colombia	0.4	1,875	250	3.6

Source: Sabre

5. Overall implications and conclusions

Compared to other international region bilateral markets, the market between the EU and Latin America/Caribbean has suffered from limited connectivity and lower levels of airline and airport competition. This paper explored the trends in the market in the period 2002-2016 and discussed the factors that may explain this situation.

The results corroborate that geography is a main determinant of passenger air transport activity and that, in the case of the specific market, physical distance poses operational and economic conditions that can limit connectivity and competition. Flight distances between European and Latin American/ Caribbean airports range between 5,500 and 12,000 km crossing the Atlantic Ocean and are normally served by wide body, long-range aircraft that carry between 250 and 600 passengers. The capital costs associated with the employment of such aircraft may make their use economically feasible only for a limited number of routes that can ensure a critical mass of traffic. Apart from decreasing the number of potential direct connections, those operational and financial restrictions may also create a barrier to entry for smaller airlines and LCCs (long-haul low-cost carriers).

The evolution of the air transport network for long distance flights appears to have entered into a cycle. Given the long flight distance and the scarcity of airports with sufficient demand for direct flights to/ from Europe, most of the traffic is channelled through a handful of main hubs on either side of the ocean. The number of hubs in Latin America/ Caribbean grew marginally between 2002 and 2016 as a result of (or allowing) a wider geographical spread than Europe. The dominant position of these hubs allows their high

capacity Trans-Atlantic flights to achieve economies of scale that further improve their attractiveness compared to new direct flights from other airports.

The fragmentation of the market in Latin America and the Caribbean may have reinforced the role of hubs. The non-homogeneous spatial distribution of demand on either side of the direct connections with Europe seems to have resulted in a sparse origin-destination matrix for which the development of a hub-and-spoke network is a natural result. The strong role of airline alliances could be a reaction to the challenge of ensuring connectivity between the two international regions, but is also a barrier to entry for new operators. The network economies that the three main global alliances have achieved, especially in this Trans-Atlantic market, may have in effect led to the formation of an oligopoly.

Economic instability may have also affected the evolution of connectivity and competition, at least indirectly. Even though the Latin American economy grew significantly, financial or political crises were still frequent in the region and resulted in difficulties for air transport operators. Argentina, Brazil and Venezuela are examples of such disruptions during the period of analysis. Apart from the direct impact on airlines operating in these countries, the perceived risk can act as a deterrent for new airlines to enter the market.

The comparatively low level of liberalization of air transport in Latin America and the Caribbean is an additional limitation to potential growth. However, it is not evident that liberalization can be a driver of growth on its own. The few examples of opening up air transport in the region suggest that additional conditions are necessary, especially as regards the size of the market and the potential of new trans-Atlantic connections to reach critical mass.

Lastly, the analysis of the trends in Latin America and the Caribbean suggests that air transport largely depends on the wider policy context. The countries that have experienced a higher growth in demand, connectivity and competition have employed strategies to promote the overall attractiveness of their destinations. These strategies have mainly focused on the tourism sector, including investments in the supply of accommodation, improvement of airports and reductions in airport charges. While successful in terms of direct economic impacts, such strategies may, however, lead to an over-dependence on a specific economic sector.

The aviation industry is expected to suffer a strong blow due to the covid-19 pandemic. For the market analyzed here, the impact can be extremely negative. Demand for long distance

travel will take longer to recover and touristic destinations in the region will probably be avoided by European travellers until after the pandemic has been brought under control for a reasonable period. As a result, passenger volumes, number of connections, network efficiency and levels of competition are all expected to worsen significantly, reinforcing the underlying weaknesses of the air transport network that were identified in this paper.

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Appendix 1: Airport code key

Airport code	Airport name	City	Country
AMS	Schiphol	Amsterdam	Netherlands
ANU	V C Bird Intl	Antigua	Antigua and Barbuda
BCN	Barcelona	Barcelona	Spain
BGI	Grantley Adams Intl	Bridgetown	Barbados
BOG	Eldorado Intl	Bogota	Colombia
CAY	Rochambeau	Cayenne	French Guiana
CCS	Simon Bolivar Intl	Caracas	Venezuela
CDG	Charles De Gaulle	Paris	France
CUR	Hato	Willemstad	Netherlands Antilles
EZE	Ministro Pistarini	Buenos Aires	Argentina
FCO	Fiumicino	Rome	Italy
FDF	Le Lamentin	Fort-de-france	Martinique
GIG	Galeao Antonio Carlos Jobim	Rio De Janeiro	Brazil
GRU	Guarulhos Gov Andre Franco Montouro	Sao Paulo	Brazil
HAV	Jose Marti Intl	Havana	Cuba
LGW	Gatwick	London	United Kingdom
LHR	Heathrow	London	United Kingdom
LIM	Jorge Chavez Intl	Lima	Peru
LIS	Lisboa	Lisbon	Portugal
MAD	Barajas	Madrid	Spain
MBJ	Sangster Intl	Montego Bay	Jamaica
MXP	Malpensa	Milano	Italy
ORY	Orly	Paris	France
PBM	Johan A Pengel Intl	Zandery	Suriname
PTP	Le Raizet	Pointe-a-pitre	Guadeloupe
PUJ	Punta Cana Intl	Punta Cana	Dominican Republic
SCL	Arturo Merino Benitez Intl	Santiago	Chile
SDQ	Las Americas Intl	Santo Domingo	Dominican Republic
UVF	Hewanorra Intl	Hewandorra	Saint Lucia

Appendix 2: Freedoms of the air with examples

Freedom	Description	Examples
1st	The right to fly across the territory of the freedom granting country without landing.	A flight from Colombia to Spain, flown by a Colombian airline, flying over Portugal/ A flight from Spain to Argentina, flown by a Spanish airline, flying over Brazil.
2nd	The right to stop for technical reasons in the freedom granting country.	A flight from Spain to Argentina, flown by a Spanish airline, refuelling in Brazil without (dis)embarking passengers or cargo.
3rd	The right to fly from the freedom receiving country to the freedom granting country	A flight from Spain to Colombia, flown by a Spanish airline.
4th	The right to fly from the freedom granting country to the freedom receiving country	A flight from Colombia to Spain, flown by a Spanish airline.
5th	The right for a flight originating in the freedom receiving country to fly between the freedom granting country and a third country	A flight from Spain to Argentina with a stop in Brazil. Passengers can embark or disembark in the Brazilian airport.
6th	The right to fly from the freedom granting country to a third country, stopping in the freedom receiving country.	A flight from Brazil to Cuba, flown by an airline based in France, with a stop in Guadeloupe (French Overseas Territory).
7th	The right to fly between the freedom granting country to any third country	A flight between Brazil and Argentina, flown by a Spanish airline.
8th	The right to fly between two airports in the freedom granting country before continuing to the freedom receiving country	A flight by a Portuguese airline between Rio de Janeiro, Brazil and Lisbon, Portugal, with a stop in Fortaleza, Brazil. Passengers can embark or disembark in Fortaleza.
9th	The right to fly within the freedom granting country without continuing to the freedom receiving country.	A flight between Rio de Janeiro and Fortaleza operated by a Portuguese airline without connecting to a Portuguese airport.

Appendix 3: Inter-continental market segment comparison

Market segment	Passengers / year (millions)		Average fare (USD)		Change 2011-2016	
	2016	2011	2016	2011	Passengers	Fare
Within Latin America & Caribbean	181.7	158.6	119	158	14.6%	-24.7%
North America	9.4	7.0	507	548	33.3%	-7.5%
Europe	6.8	6.0	702	870	12.2%	-19.3%
Gulf/Middle East	0.4	0.2	854	1289	77.6%	-33.7%
Australia/Pacific	0.2	0.2	889	1348	23.1%	-34.1%
Rest of the World	0.3	0.3	624	872	14.0%	-28.5%