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US feeder airlines: Industry structure, networks and performance☆

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ABSTRACT

This paper examines the US airline industry in terms of the relationships between the three largest full service carriers, American Airlines, Delta Airlines and United Airlines, and the set of regional carriers that are contracted to provide feeder services to them. The evolution of the regional carriers and the full service carriers are compared and recorded and the current industry structure and size is described. The paper uses the full set of Official Airline Guide (OAG) schedules for 2017 to analyse the industry structure and scale, overlap and seasonality in service provision among the groups of carriers and to understand the network organisation and capacity deployment strategy of the largest network carriers in the US market. The analysis provides evidence to explain how the large airlines are improving their cost and financial performance as well as significantly improving their operational efficiency through the achievement of high overall load factors. The sophistication in each airline's schedule design and service delivery is highlighted.

0. Introduction

This paper examines feeder airlines that support the mainline operations of the largest US full service air carriers.[1] The feeder airlines are made up of both certificated carriers and commuter/regional carriers that operate 'small aircraft' (i.e. aircraft with an original design capacity of 60 or fewer seats) or small regional jets with seating capacity of up to 77 seats. These feeder carriers emerged after deregulation as a key sector providing air services that gave continuity to many small and medium sized communities when certificated carriers reoriented their networks towards larger centres and away from smaller centres. The feeder carriers have also facilitated higher frequency service on short-haul routes and filled service gaps in the mainline operations across the national airports system. The current structure of the industry and relationships between feeder and mainline carriers are the focus of this paper. Frederick and Hudson (1942) examine the characteristics of feeder airlines and suggest the following broad definition in the regulated period: "A feeder airline is (1) a common carrier (2) performing the dual function of concentrating and dispersing mail, passengers, and/or property (3) within a given marketing area (4) from widely scattered points (5) to a few terminal points".

While a number of studies have examined aspects of the feeder carrier impacts on mainline operations, no detailed examination of the feeder operations has been undertaken to date. The first section of this paper examines the US and North American airline industry in the context of global air traffic patterns and highlights a number of unusual features characterising the US domestic market. Section 2 traces the evolution of the feeder carriers and their relations with the largest US mainline carriers particularly in the

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[1] The paper is not concerned with the South Sudan carrier *Feeder Airlines* founded in 2007 and rebranded as *South Supreme Airlines* in the 2010s (ICAO designator FDD) (see CAPA (Centre for Aviation) https://centreforaviation.com/data/profiles/airlines/feeder-airlines-fdd andhttps://www.ch-aviation.com/portal/airline/Fed).

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Table 1
Average population of air transport communities for major regions and hub types[a] in 2015.
Reproduced from Reynolds-Feighan (2017) and based on OAG global air transport schedules in 2015.

IATA/ICAO region	Large Hub	Medium Hub	Small Hub	Non-hub 'A'	Non-hub 'B'	Non-hub 'C'	Average for region
Africa (AF)	2,576,220	1,011,142	372,920		209,307	70,433	587,116
Asia (AS)	7,749,732	2,681,584	850,734	439,460	314,056	124,408	962,677
Europe (EU)	2,358,831	813,727	382,665	219,958	136,902	105,486	389,538
Latin America (LA)	3,921,544	849,151	427,915	183,557	194,455	64,580	598,274
Middle East (ME)	1,904,106	828,383	325,665	161,303	234,413	173,228	632,931
North America (NA)	1,333,028	461,868	158,670	68,781	48,144	90,624	199,773
Southwest (SW)	1,150,177	75,945	24,220		29,864	23,335	198,467
Average per hub type	3,104,298	1,131,526	456,197	267,258	187,128	92,019	566,948

[a] Hub Classification Scheme used to categorise air transport communities (Reynolds-Feighan, 2017).

Traffic criterion	Hub Type
1% or more of annual departure movements	Large
At least 0.25%, but less than 1% of annual departure movements	Medium
At least 0.05%, but less than 0.25% of annual departure movements	Small
More than 500 but less than 0.05% of annual departure movements	Non-Hub - Type A
Between 10 and 499 annual departure movements	Non-Hub - Type B
Less than 10 annual departure movements	Non-Hub - Type C

last decade. The current industry structure and relationships are then described in detail and characteristics of the carriers operations in 2017 are set out in Section 3. The paper concludes by demonstrating how US carriers have deployed capacity of mainline and feeder carriers to deal with geographic and demographic characteristics to achieve high utilisation of mainline capacity and realise low levels of seasonal variability compared to other global regions.

1. US air transport operations in a global context: some key distinguishing characteristics

The US airline industry is the largest national air transport market in the world, although the North American share of global traffic has been declining steadily as Asian countries rapidly expand their air transport sectors. US air traffic has become less concentrated spatially in the 2010s compared to previous decades and this pattern has been driven by a significant expansion in the number of airports (and number of routes) receiving jet services following the great recession in 2007/8. Reynolds-Feighan (2017) shows that North American communities receiving regular scheduled jet services are generally smaller than communities receiving comparable levels of air services in other global regions, reflecting a higher propensity to travel by air and higher incomes than in other regions. Table 1 is reproduced from the study and shows average population for different hub classes[2] in each major global region in 2015. In addition, the average aircraft size is significantly smaller for North America in all hub classes than in other global regions, and as the hub size gets smaller, so does the average aircraft size (i.e. number of seats per movement).

Using the Official Airline Guide (OAG) daily airline schedules, the monthly air traffic capacity[3] distributions were examined for major global regions and are summarised in Fig. 1 showing the temporal Gini index scores for 1996, 2006 and 2016. The temporal Gini is computed by measuring monthly traffic (measured as either departure movements or available seats) for each of the years indicated across the continental systems shown and adjusted to take account of the number of days per month (see Reynolds-Feighan, forthcoming) for a more thorough discussion). If every month has an equal traffic share, the temporal Gini Index takes a value of 0. As the monthly traffic distribution varies, the Gini Index value increases. If all of the traffic takes place in just 1 month, then the Gini Index score will be 1. The Gini Index scores in Fig. 1 range from 0.04 to 0.14, reflecting the fact that significant traffic volumes take place in every month of the year for the continental regions.[4] The North American temporal Gini scores are consistently lower than

[2] The FAA hub classification system is adapted and applied to major global regions to classify global communities based on annual departure movements; these are linked to urban population data (see Reynolds-Feighan, 2017).

[3] Air traffic in this paper is measured as either non-stop departure movements (take-offs) or available seats on non-stop departure movements. The OAG schedules give the ex-post daily airline schedules and represent a 'supply-side' view of air traffic operations. Daily, weekly, monthly or yearly measures of traffic can be compiled by carrier, airport pair and aircraft. Detailed and consistent passenger numbers reflecting demand are not available.

[4] The Gini index summarises the pairwise variability between each month's traffic and every other month. Because there are just 12 month categories, temporal Gini Index scores will be relatively low if there are significant traffic volumes recorded in each month. The temporal Gini Index scores were compared with the ratio of the lowest:highest months' traffic for hundreds of airports and airlines and as the ratio decreased (showing