

Do European carriers dominate their connecting markets?

A methodology for the analysis of market concentration on transfer routes

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Outline

- Hub-and-spoke networks in the U.S. and Europe
- Hub-competition and transfer dominance
- Methodology: weighted indirect connectivity
- Transfer dominance in Europe
- Determinants of transfer dominance
- Conclusions and research agenda

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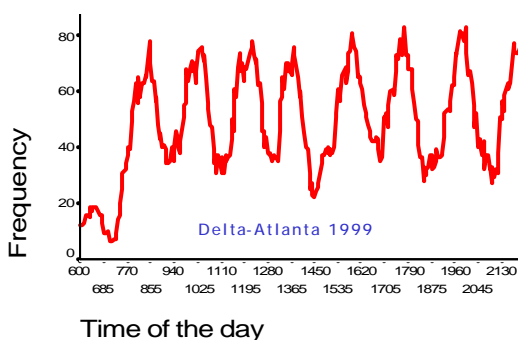
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Hub and spoke networks United States

1. Spatial concentration of airline networks around a limited number of hubs
2. Temporal concentration: adoption of wave-system structures

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Temporal concentration



Competition

- Mixed market concentration result:
 - Fortress hubs, local route concentration, hub premia (e.g. Borenstein, 1989)
 - Hub-competition and decreasing transfer dominance (e.g. DoT, 1990)

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Herfindahl index US market

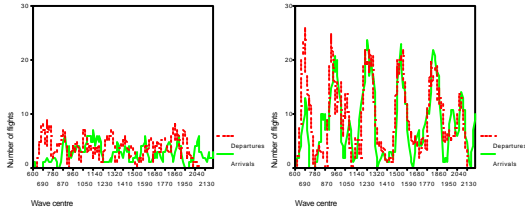
	1984	1987	1990
Direct routes	0.590	0.620	0.632
All routes	0.531	0.512	0.506

Source: Borenstein, 1992

Hub and spoke networks in Europe

- Spatial concentration: stable due to bilateral regulation of ica-services but about to change
- Temporal concentration: adoption and intensification of wave-system structures

Wave-system structure Air France Paris CDG

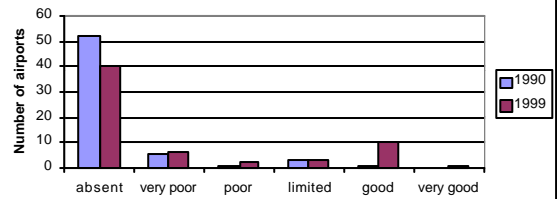


1990

1999

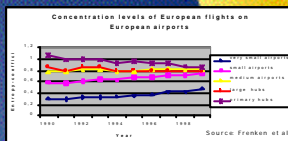
Temporal concentration

Number of airports with wave-system structure



Competition

- Market concentration result:
 - Fortress hubs, local concentration and hub premia (e.g. Lijesen et al., 2001)
 - Increased hub competition and decreasing transfer dominance?

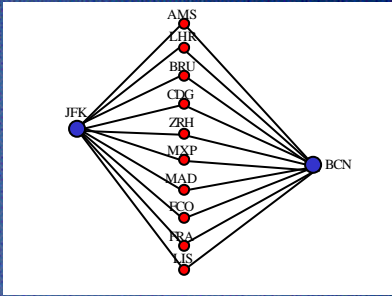


Source: Franken et al.

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Hub-competition JFK-BCN



Research questions

- How to measure market concentration in transfer markets without the availability of transfer passenger data?
- To what extent do European carriers dominate their transfer markets?
- What are the most important determinants of transfer dominance?

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Weighted indirect connectivity (WNX)

- Total number of indirect connections (per indirect route, geographical market, airport or airline) meeting criteria of minimum and maximum connecting time, weighted by:
 - Transfer time
 - Routing factor

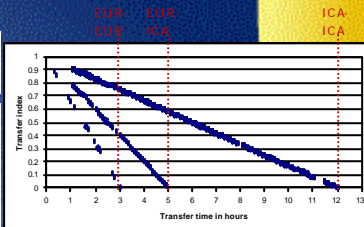
Indirect connectivity measure based on insights from the connectivity measures of Veldhuis (1997) (CNU) and Bootsma (1997) (CNX)

1 weighted indirect connection: WI

$$WI = \frac{2.4 * TI + RI}{3.4}$$

TI: Transfer index
 RI: Routing index
 Tj: Maximum connecting time connection j
 Th: Transfer time

$$TI = 1 - \frac{1}{T_j} T_h$$



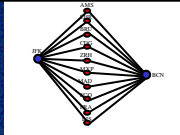
$$WNX = \text{SUM WI}$$

Herfindahl index indirect connectivity

$$H = \sum_i \left(x_i / \sum x_i \right)^2$$

x_i is the weighted indirect connectivity of an airline in a certain transfer market (e.g. JFK-BCN)

JFK-BCN market 1999 (weekday)



Airline	Hub	WNX	Market share
SN	BRU	1.65	0.06
TP	LIS	0.57	0.02
SR	ZRH	1.99	0.07
IB	MAD	10.25	0.35
KL	AMS	2.9	0.10
BA	LHR	2.56	0.09
LH	FRA	2.044	0.07
AF	CDG	3.6	0.12
AZ	FCO/MXP	1.19	0.14
TOTAL		29.564	1.00

Source: OAG

Herfindahl=0.18
Moderately
concentrated

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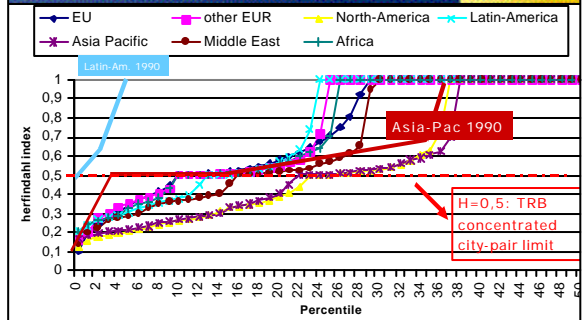
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Herfindahl values at indirect routes (one-stop, EU airline hubs only)

	Avg. Herfindahl index		number of routes	
	1990	1999	1990	1999
intra-EU	0.88	0.86	3029	5764
EU-ICA (outbound)	0.86	0.82	2363	7216
ICA-EU (inbound)	0.83	0.81	2716	7000
ICA-ICA (directional)	0.89	0.81	889	3183
Total	0.86	0.83	8997	23163

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Distribution Herfindahl index EU to ICA market, 1999



Development market concentration transfer routes (one-stop, EU airlines)

- Overall decrease of market concentration on transfer routes
- EU airlines still dominate their transfer markets to a large extent. In 1999, 70% of indirect routes monopolized, 11% not concentrated according to TRB standards
- North-America and Asia-Pacific markets most competitive

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Determinants of market concentration on transfer routes

- Potential market size/ gravity (Borenstein, 1992: DOT, 1990; Goetz, 1992)
- Distance between endpoints (e.g. Borenstein, 1992: Dot 1990; Goetz, 2002)
- Regulatory regime (e.g. DoT, 1999)
- Airport concentration at endpoints of the transfer route (e.g. DoT, 1990)
- Presence of direct service
- Network strategy of carriers serving endpoints: HS versus PP (e.g. DoT, 1990; DoT, 1999)

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OLS regression: market concentration on intra-European transfer routes (EU airlines only)

	Coefficient	R ² change
Gravity (log)	0.297 ***	0.102
Distance (sqrt)	0.240 ***	0.066
<i>airport concentration endpoints</i>		0.010
Herfindahl dep airport (log)	-0.075 ***	
Herfindahl arrival airport (log)	-0.064 **	
Direct connection available	-0.041 *	0.001
Dummy other Europe	0.015	0.000

* $\hat{\alpha} < -0.10$; ** $\hat{\alpha} < -0.05$; *** $\hat{\alpha} < -0.00$
 dependent: Herfindahl (transformed inverse), $h < 1$, $R^2 = 0.18$

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OLS regression market concentration on EU<->ICA transfer routes (EU airlines and hubs only)

	Coefficient	R ² change
Gravity (log)	0.424 ***	0.214
Distance (sqrt)	0.053 **	0.000
<i>airport concentration endpoints</i>		0.102
Herfindahl dep airport (log)	-0.273 ***	
Herfindahl arrival airport (log)	-0.247 ***	
Direct service available	0.077 ***	0.005
<i>Market region (dummy)</i>		0.009
North-America (North-America-ref.)		
Latin-America	-0.030 **	
Asia-Pacific	0.002	
Middle-East	-0.013	
Africa	0.091 ***	

* $\hat{\alpha} < -0.10$; ** $\hat{\alpha} < -0.05$; *** $\hat{\alpha} < -0.00$
 dependent: Herfindahl (transformed inverse), $h < 1$, $R^2 = 0.33$

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Conclusions

- Use of WNX measure of indirect connectivity allows for the analysis of market concentration on transfer routes without availability of transfer passenger data
- Various studies show an increase in hub-dominance at local hub-routes in Europe and the US
- Market concentration at indirect routes via EU airline hubs decreased between 1990 and 1999 but is still high
- Market potential, distance and airport concentration at endpoints most important determinants for transfer dominance

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Research agenda

- Work in progress
- Validity of regression-analysis:
 - endogenous versus exogenous variables
 - herfindahl index and normality
 - herfindahl=1 model
- How to include network strategies of carriers and regulatory regimes?
- Which variables are missing?
- Include 2-stop transfer routes and non-EU airlines/ non-EU airline hubs
- Include global alliances and recent data

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