Does one model fit them all?

A network design analysis of airline business model adaptation in face of competition

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GUI LOHMANN

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ITA, São José dos Campos – August 20, 2019

Airneth

Airline Business Model Convergence in Europe

01.09.2015
By Sascha Albers

AVIATION WEEK NETWORK

Opinion: Airline Business Models Converging Across U.S., Europe

Low-cost, legacy carriers move toward same business model, on both sides of Atlantic

Pierre Sparaco | *Aviation Week & Space Technology* *Nov 3, 2014*

EMBRAER

Motivation

Regulators

LCCs major role in the expansion of aviation (e.g. Brazil: attract LCCs);

Stock markets

LCCs have an image of being more robust against economic crises as they have higher operating margins (efficiency) and lower bankruptcy risk;

Airports

Air route development efforts: FSC less likely to withdraw a service (Stephenson et al., 2018);

Airline managers

What is the trend of the industry and is it profitable (follow or avoid).

Alamdari and Fagan (2005)
Tsoukalas et al. (2008)
Jarach et al. (2009)
Daft and Albers (2015)
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Wide variety of perspectives

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Wide variety of perspectives

Klophaus et al. (2012) - airport choices and network strategies
Fageda et al. (2015) - fare unbundling and point-to-point operation

***An airline's network is an overt manifestation of strategic behavior*.**

(Holloway, 2008, p. 366)

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Brand identity
Revenue driver
Cost driver
Competitive strength or weakness
Hedge against economic cycles

Research question

“Given a set of archetypical business models and their corresponding network design mentalities, how carriers’ observed network behaviors conform with them?”

Context

Brazilian air transportation data (2001-2013);
Remarkable expansions and business model adaptations of Gol and Azul;

Contribution

Framework of conformity of observed business models to archetypes;

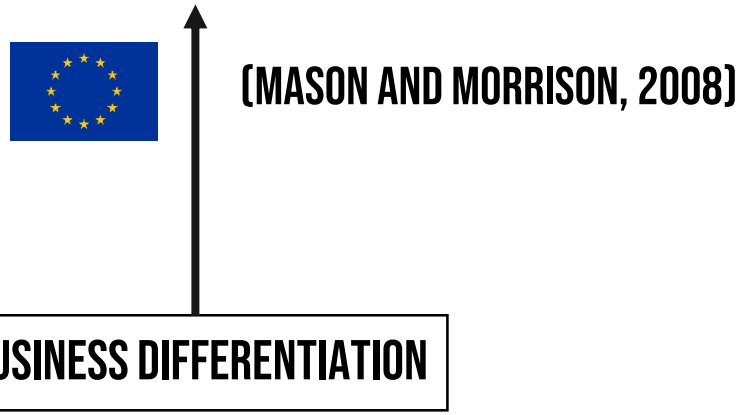
Evaluation of the extent of convergence between carriers;

Inference towards which side of the business spectrum convergence occurred;

LITERATURE REVIEW

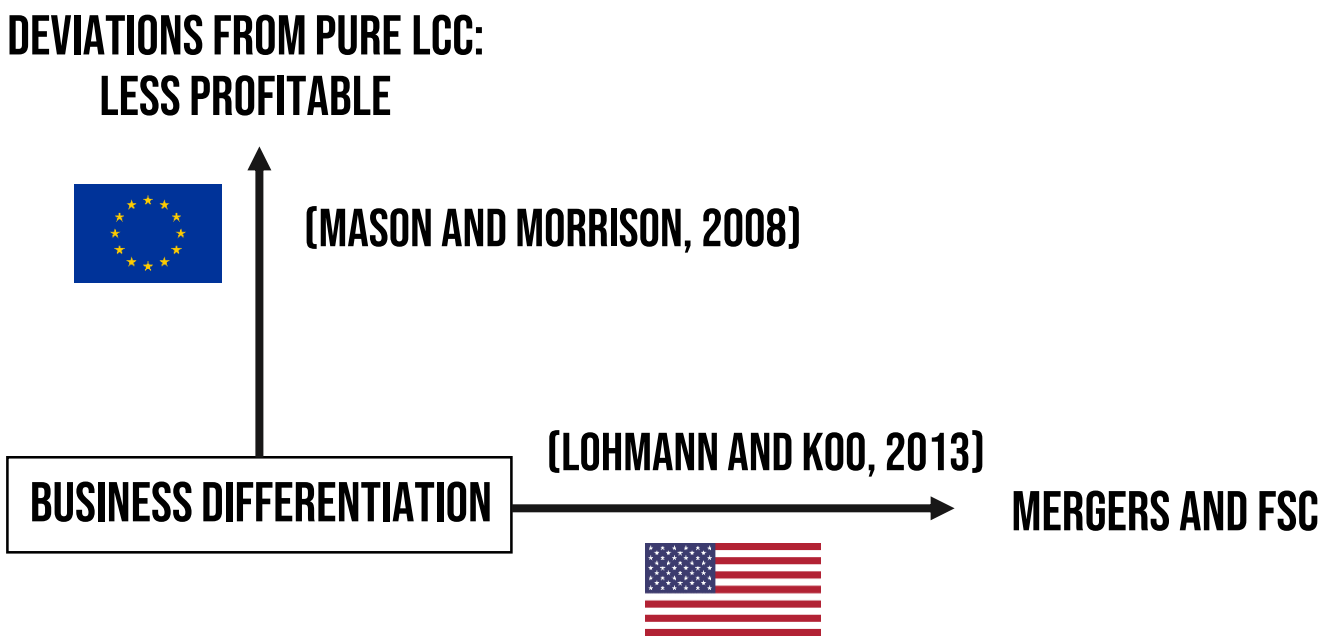
BUSINESS DIFFERENTIATION

DEVIATIONS FROM PURE LCC:
LESS PROFITABLE



(MASON AND MORRISON, 2008)

BUSINESS DIFFERENTIATION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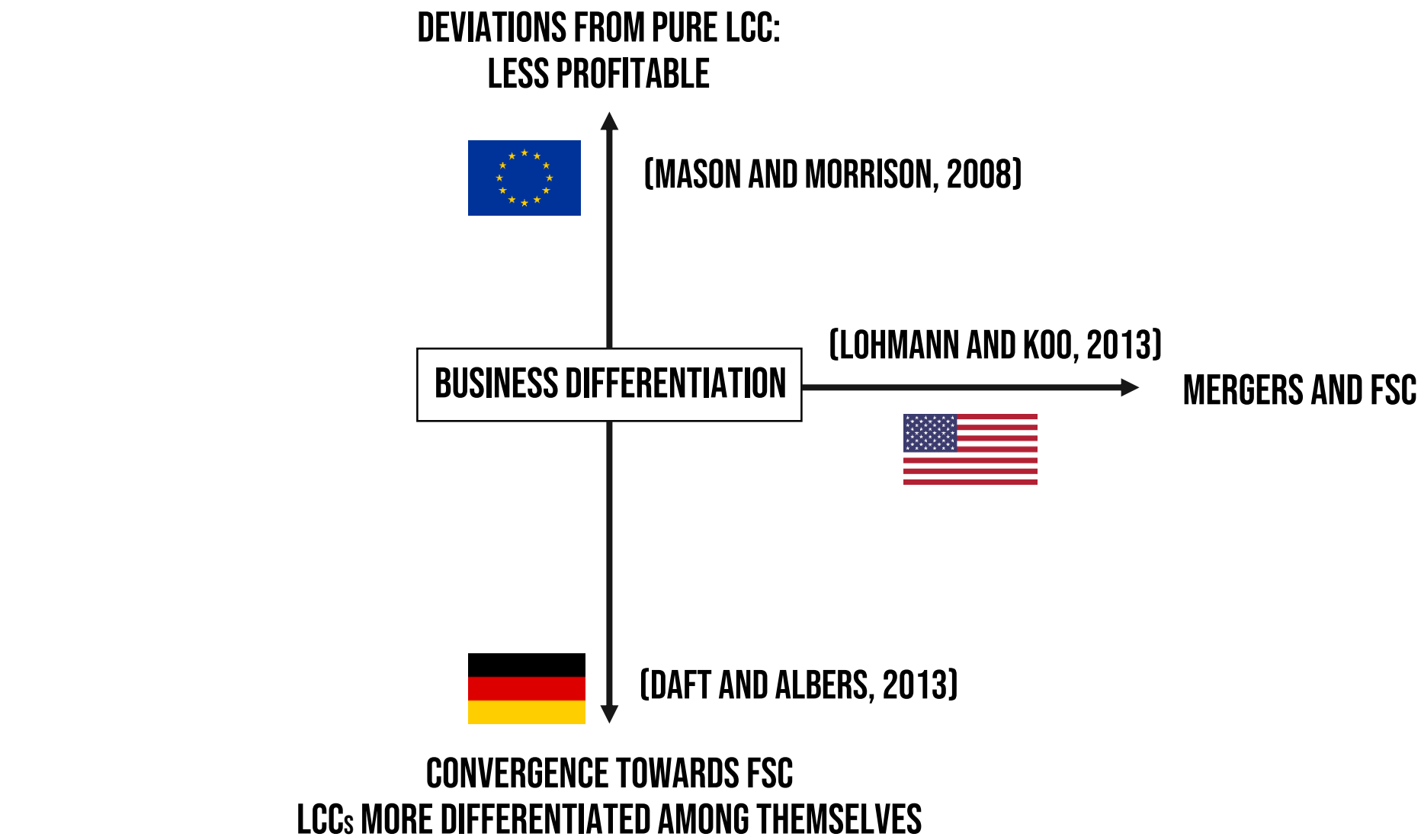
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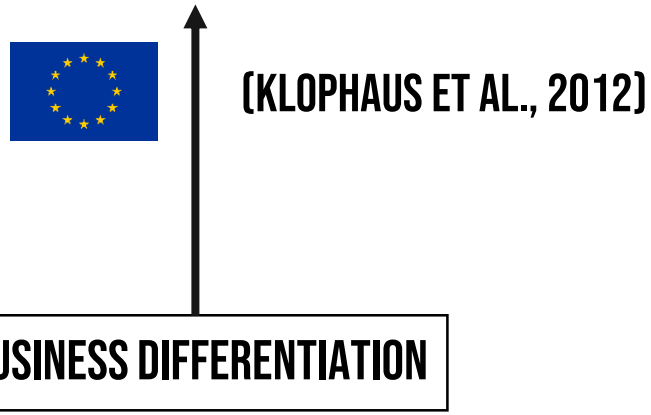
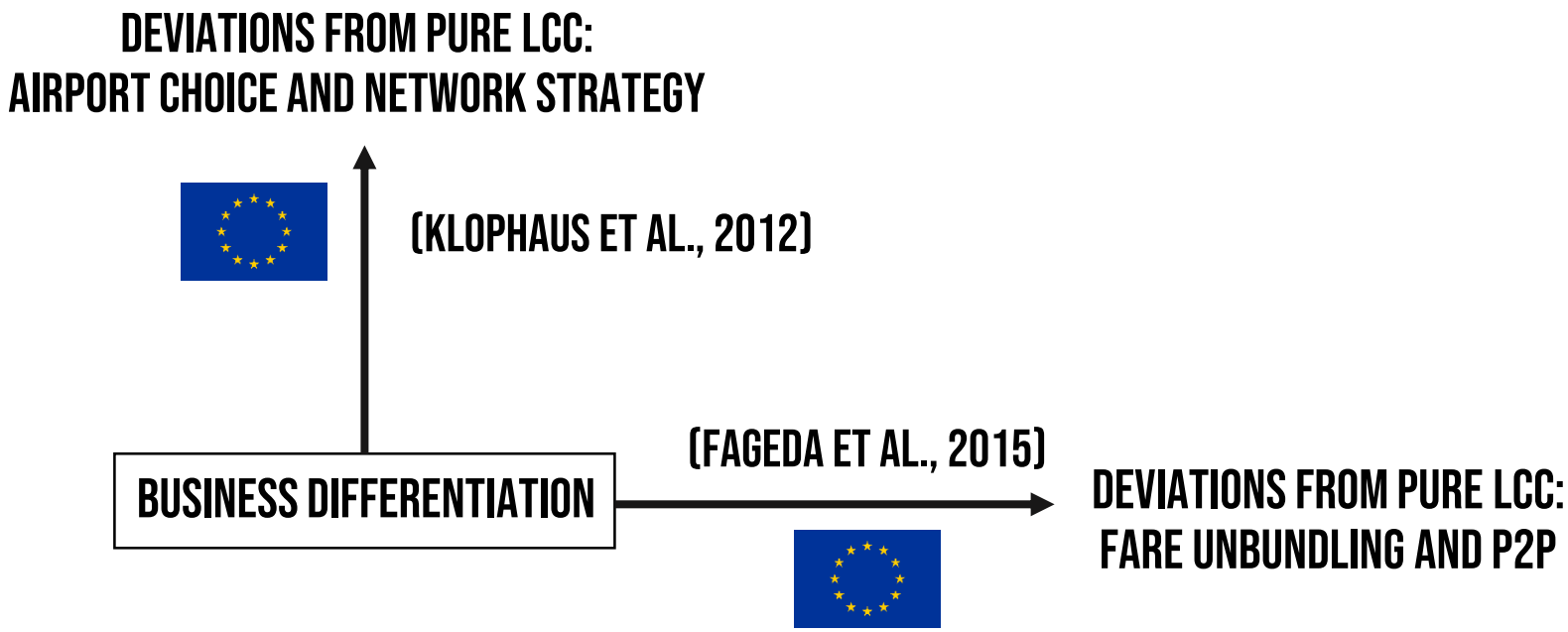
CONVERGENCE TOWARDS FSC
LCCs MORE DIFFERENTIATED AMONG THEMSELVES

DEVIATIONS FROM PURE LCC:
AIRPORT CHOICE AND NETWORK STRATEGY

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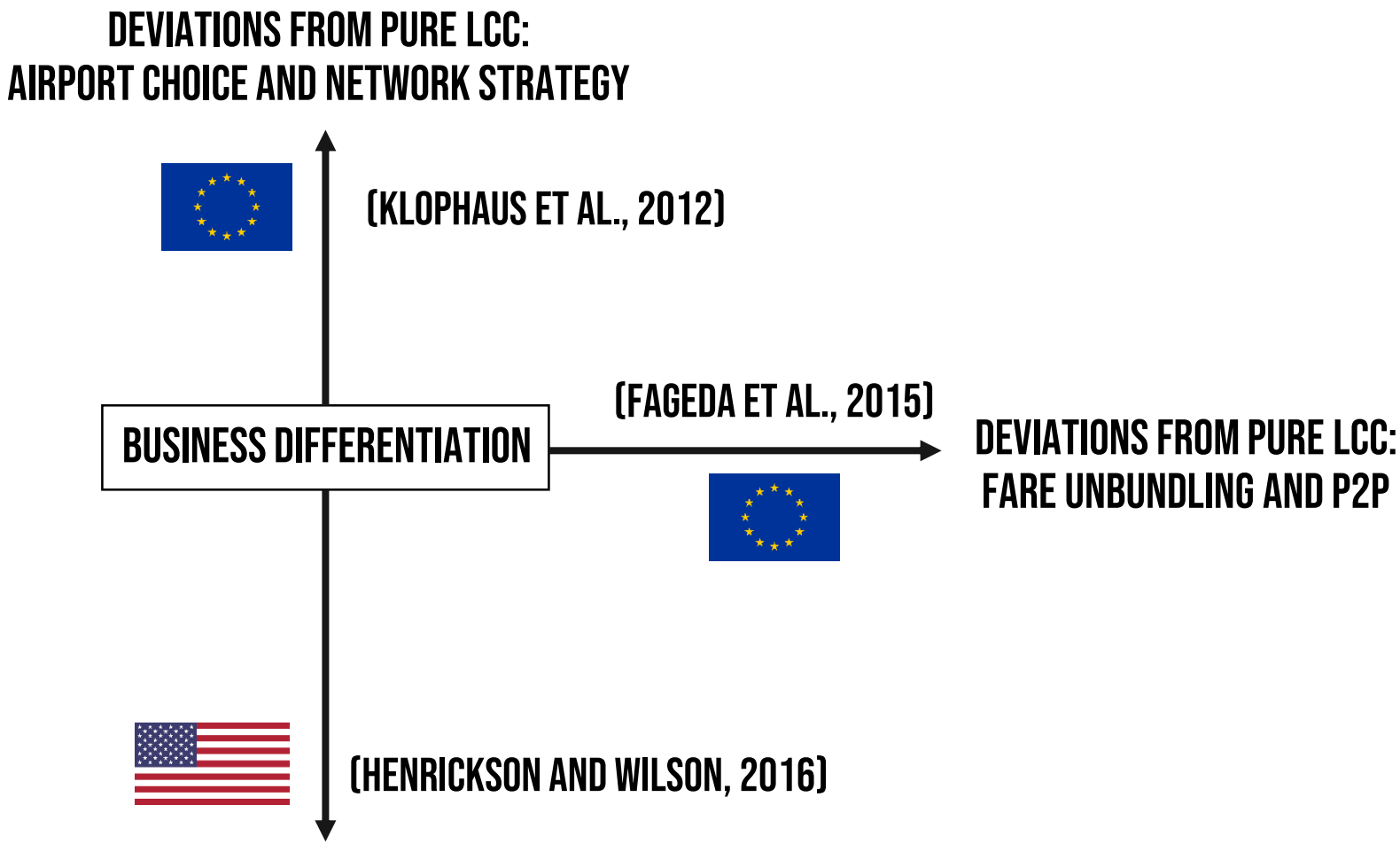
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CONVERGENCE BETWEEN LCCs AND FSCs
PARTICULARLY, TOWARDS THE FSC SIDE

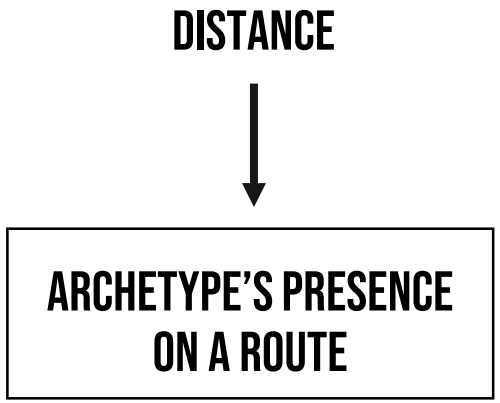
Business model landscape in Brazil

CONCEPTUAL MODEL

1st Stage

ARCHETYPE'S PRESENCE
ON A ROUTE

1st Stage



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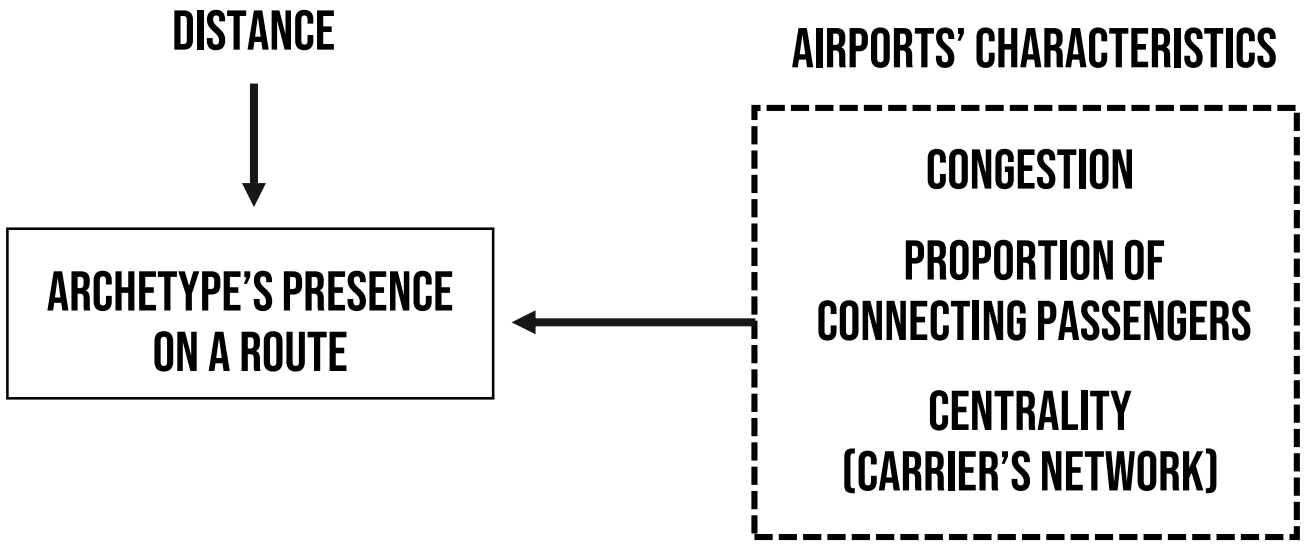
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ARCHETYPE'S PRESENCE ON A ROUTE
CONGESTION
PROPORTION OF CONNECTING PASSENGERS
CENTRALITY (CARRIER'S NETWORK)

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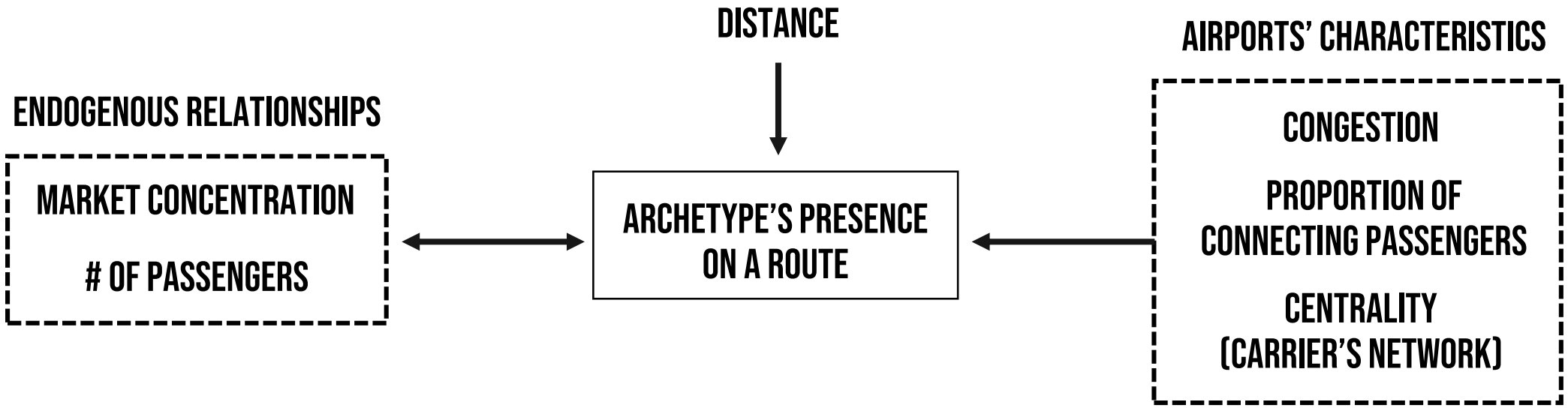
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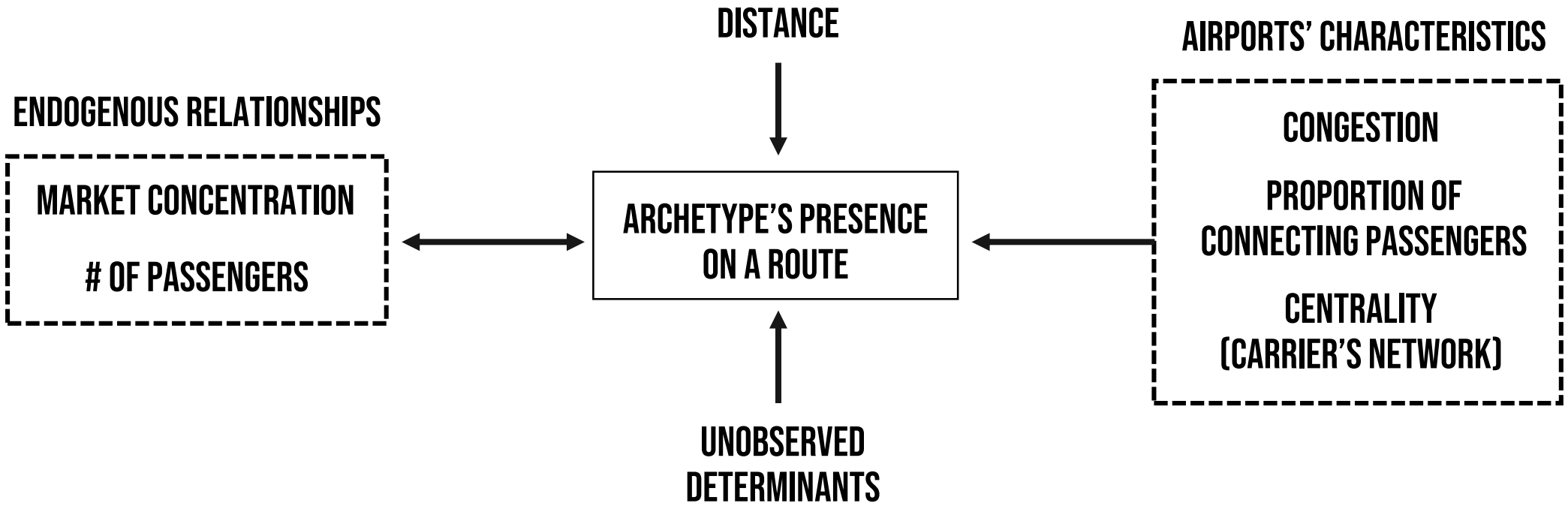
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CENTRALITY (CARRIER'S NETWORK)
UNOBSERVED DETERMINANTS

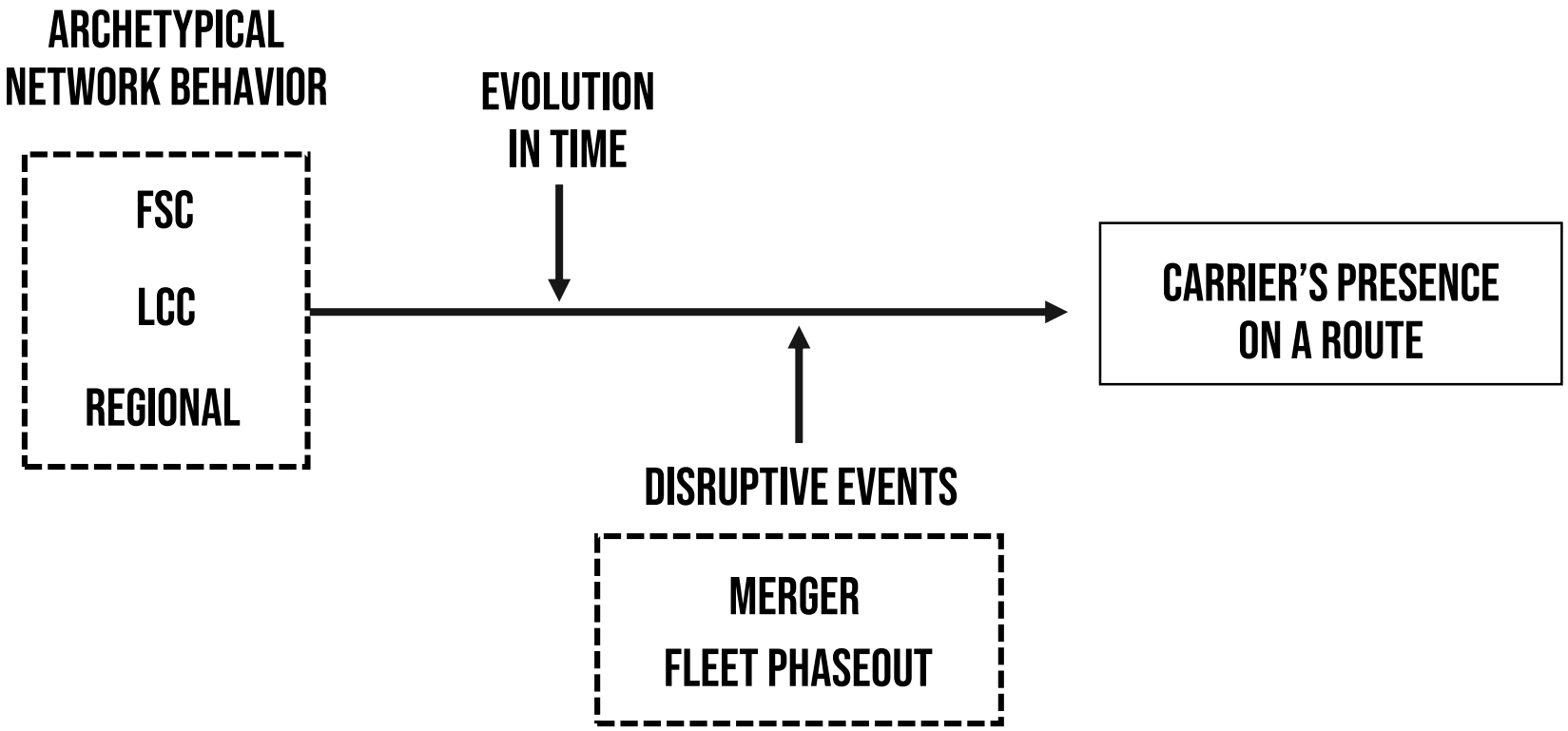
2nd Stage

CARRIER'S PRESENCE
ON A ROUTE

2nd Stage


ARCHETYPICAL
NETWORK BEHAVIOR
FSC
LCC
REGIONAL
CARRIER'S PRESENCE
ON A ROUTE

2nd Stage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NETWORK BEHAVIOR
FSC
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EVOLUTION
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CARRIER'S PRESENCE
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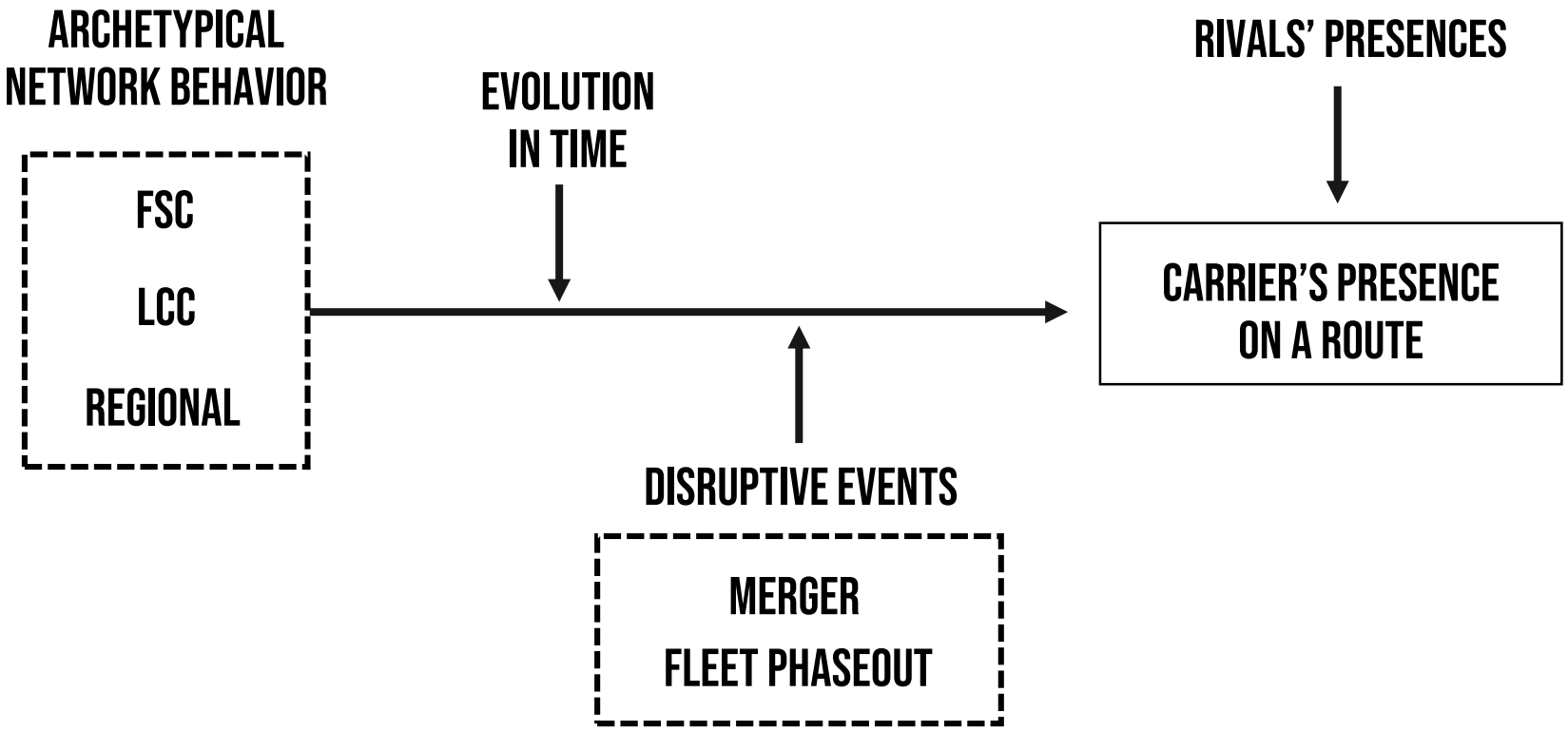
DISRUPTIVE EVENTS
MERGER
FLEET PHASEOUT

2nd Stage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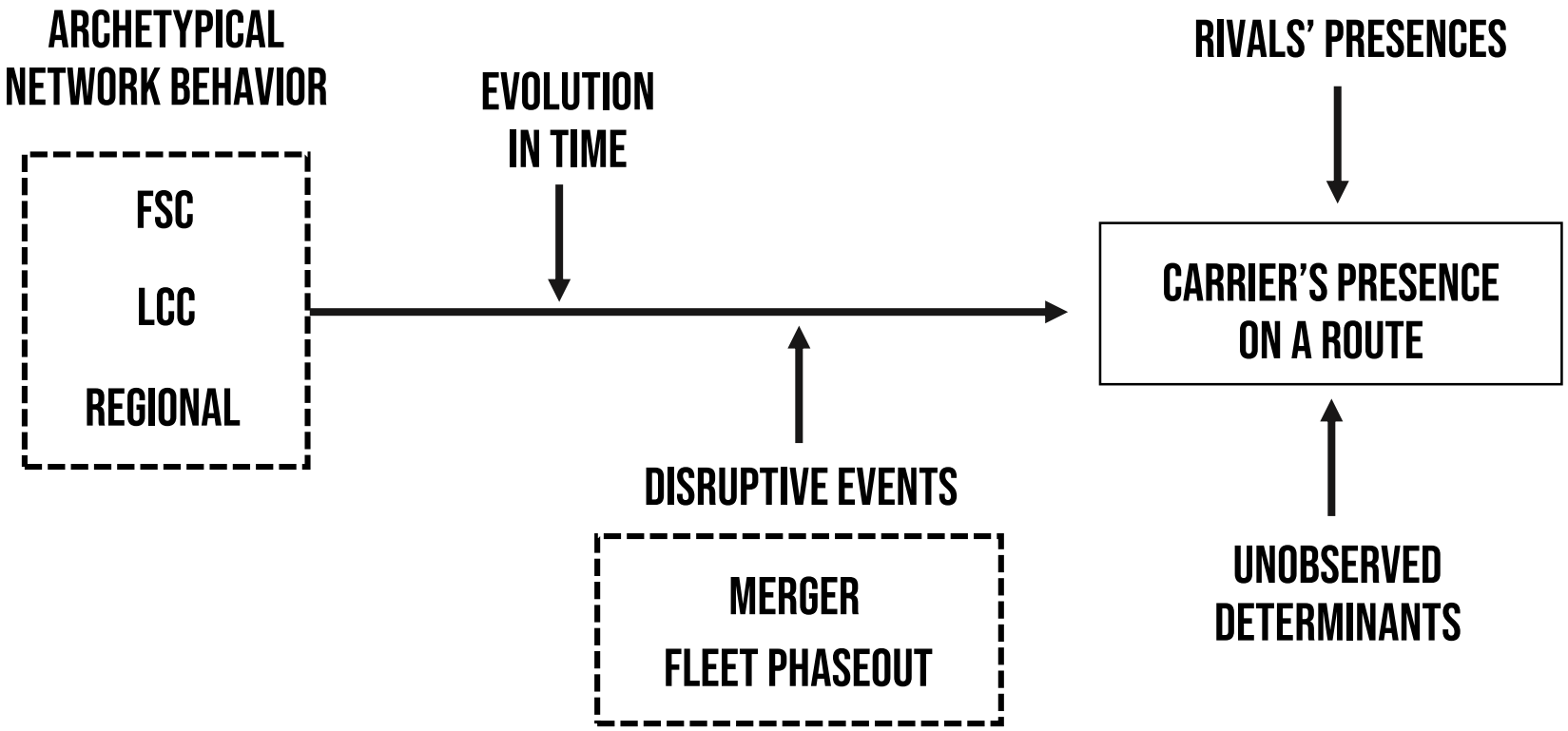
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Data

Brazilian air transportation industry;

Sources: ANAC, IPEA, IBGE;

Period: 2001 – 2013;

Data

A route is defined as directed city pair market;

Only routes with distances of more than 100 miles and more than 6 observations overall, to focus only on the most enduring flows;

364 markets and 4,396 route/year observations;

Econometric Model

Left side: Binary variable of presence;

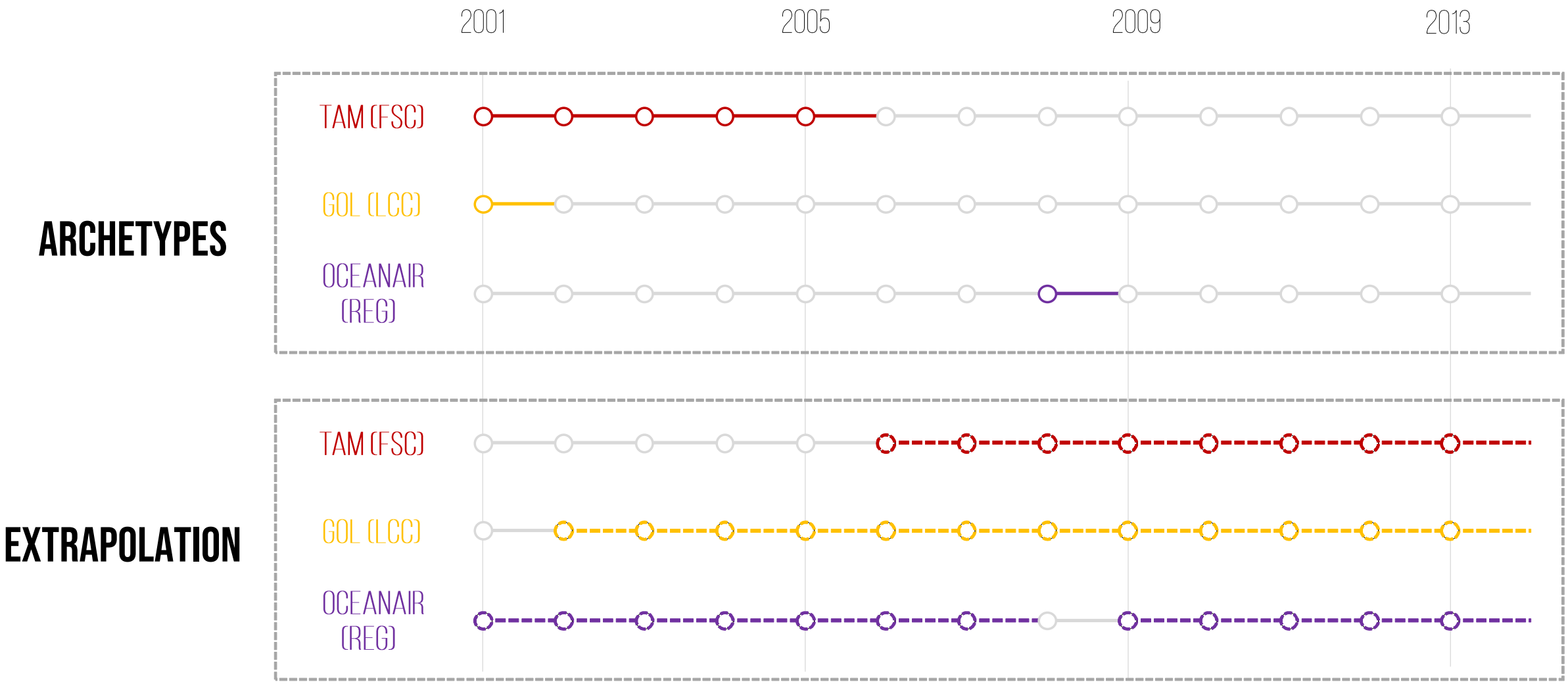
Data panel (routes over time);

Yearly observations;

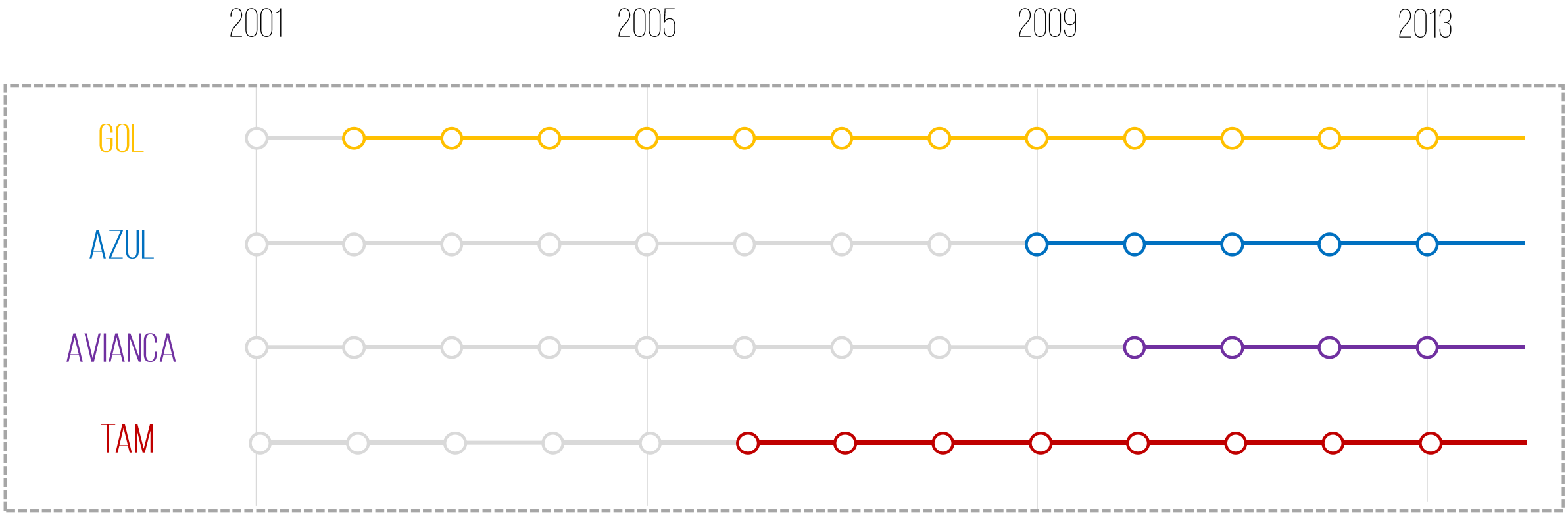
Probit model;

Route random effects;

Instrumentation of the variables HHI and number of passengers;


2001
2005
2009
2013
ARCHETYPES
TAM (FSC)
GOL (LCC)
OCEANAIR (REG)
EXTRAPOLATION
TAM (FSC)
GOL (LCC)
OCEANAIR (REG)

CARRIERS



Results

Estimation results of the 1st stage (archetypical mentalities)

Variables	(1) FSC	(2) LCC	(3) RGC
DIST	2.0834**	5.3402***	1.3594**
$DIST^2$	-0.8088**	-2.2024***	-0.7821**
HHI (endogenous)	0.5124	0.6329	2.6294**
PAX (endogenous)	3.0443***	2.0611***	0.4298***
NETSIZE	-0.5804	-3.3448*	10.3498***
HUB	-0.1358	0.8532	-0.5047*
CONGEST	0.1244	0.0068	0.1044**
Regional dummies	*yes*	*yes*	*yes*
McFadden R2	0.1852	0.2669	0.2069
McKelvey & Zavoina R2	0.9745	0.9450	0.6360
Kleibergen-Paap rk Wald F statistic	22.9062	18.5595	47.7317
Cragg-Donald Wald statistic	5.7605	4.7150	13.2137
Hansen J statistic	0.7649	1.0777	0.8707
Nr. of observations	1526	300	362

*Notes: p-value representations: ***p<0.01, ** p<0.05, * p<010.*

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Estimation results of the 2nd stage (network design drivers)

Variables	(1) GOL	(2) AZU	(3) AVI	(4) TAM
Business model Archetypes				
PR_FSC	0.1434***	0.0391	0.1951***	0.2863***
PR_LCC	0.1588***	-0.0759*	0.0908	0.0936***
PR_ RGC	-0.0314	-0.0199	0.2458***	0.1308***
Competitors				
GOL		-0.0012	0.1359***	0.1352***
AZU	-0.0076***		-0.0305***	0.0064
AVI	0.0057***	-0.0134***		-0.0131***
TAM	0.0376***	0.0497***	-0.1389***	
Events				
PR_FSC × MERGER	-0.0112	-0.0048		0.0057
PR_LCC × MERGER	0.0108	-0.0058		-0.0130***
PR_ RGC × MERGER	-0.0675***	0.0354***		0.0018
PR_FSC × PHASEOUT			0.0040	
PR_LCC × PHASEOUT			0.0143	
PR_ RGC × PHASEOUT			-0.1018**	
Evolution				
PR_FSC × TREND	-0.0172	0.0986***	0.0248	-0.1422***
PR_LCC × TREND	-0.0226	0.1708***	0.0050	0.0702***
PR_ RGC × TREND	0.1312***	0.1057**	-0.1352***	-0.0826***
Route fixed effects	*yes*	*yes*	*yes*	*yes*
Time fixed effects	*yes*	*yes*	*yes*	*yes*
McFadden R2	0.4215	0.4265	0.2403	0.4397
McKelvey & Zavoina R2	0.9696	0.7070	0.6378	0.9764
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Concluding Remarks

Both FSCs converged to the oldest LCC, Gol Airlines, while diverging from each other;

Mergers in Brazil appear to be more diverse with regards to business model reorientation;

Influences by rivals, but not to the point of deviating from business model baselines (given the robustness checks);

Incorporating LCC practices into a business model appears to be advisable, at least in the Brazilian air transportation context.

Limitations and Next Steps

Extend the dataset: monthly observations + until December 2018;

Spatial and time correlation between routes choices in both stages;

Use of mutivariate probit in the second stage.

More About:

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Thanks!

Does one model fit them all?

A network design analysis of airline business model adaptation in face of competition

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ALESSANDRO V.M. OLIVEIRA
GUI LOHMANN

Workshop ITA-MIT on Big Data Analytics for Air Transportation
ITA, São José dos Campos – August 20, 2019