Mini-Curso

Formação de Preços em Transporte Aéreo: Modelos e Discussões Regulatórias

Alessandro V. M. Oliveira
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Congresso Nacional de Ensino e Pesquisa em Transporte - ANPET

Objetivo do Mini-Curso

- Precificação de companhias aéreas
  - Como os preços são formados?
  - Porque há tanta dispersão de tarifas?
  - Quais os condicionantes concorrenciais e regulatórios?
    - Qual o papel da dominância de rotas e aeroportos?
  - O que diz a literatura?
- Motivação

Maior popularização do transporte aéreo

Recorde de venda de passagens

- "Mercado de transporte aéreo cresce no Brasil acima da média mundial"
- "Procura por transporte aéreo cresce 23,4% em 2010"
- "Demanda por transporte aéreo doméstico cresce 13,45% em agosto"
- "Demanda por transporte aéreo cresce 28,67% em maio, diz Anac"
- "Transporte aéreo do Brasil foi o que mais cresceu em junho, aponta Iata"

Fonte: mídia na internet, diversos entre 2007 e 2011

Acesso de mais segmentos da população

- "Empresas investem para atender turistas da classe C e D"
- "De olho na baixa renda, empresa lança carnê da aviação"
- "Passageiros preferem aviões e carros a ônibus em Santa Catarina"
- "Agência vende passagem de avião com pagamento em carnê na Rocinha"
- "Depois de estande na Feira de São Cristóvão, cia vai abrir loja na Central do Brasil “
- "Internet tem descontos para passagens aéreas"
- "TAM e Azul agora vendem passagens aéreas em supermercados"
- "Gol vende passagens no metrô de São Paulo com promoção a R$ 10"
- "Viagens aéreas superam as de ônibus no Piauí"
- "Aviação ficou popular e brasileiro viaja mais"

Fonte: mídia na internet, diversos entre 2007 e 2011

Recorde de preços baixos

Fonte: imagens na internet, extraídas em set-2011

Mini-Curso: Estrutura

- Análise da literatura
  - práticas e estratégias de precificação de cias aéreas
    - seleção de artigos específicos da literatura
- Ênfase: modelos econométricos do setor
  - questões recentes de modelagem
    - estruturação do problema, perguntas de pesquisa, bases de dados, modelos e potencial uso da teoria microeconômica
    - tendências dos artigos internacionais e nacionais
    - modelagem não-estrutural
  - Questões práticas
    - desregulação econômica, as restrições aeroportuárias, a dominância de aeroportos, a defesa da concorrência e a concorrência com empresas *low cost, low fare*.
- Disponível em www.nectar.ita.br/anpet2011.htm

Amostra da Literatura

1. Morrison & Whinston (1986)
2. Borenstein (1989)
3. Evans & Kessides (1994)
4. Hofer, Dresner & Windle (2008)
5. Oliveira & Huse (2009, 2012)
6. Oliveira, Bettini e Vassallo (2011)

Formação de Preços em Transporte Aéreo:
Modelos e Discussões Regulatórias

Módulo I
Desregulação, Concorrência e Concentração

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Modelos e Discussões Regulatórias

Módulo II
Modelos de Negócio e Contestabilidade

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Formação de Preços em Transporte Aéreo:
Modelos e Discussões Regulatórias

Módulo IIII
Dinâmica Nacional, Regulação e Recursos Essenciais

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Formação de Preços em Transporte Aéreo:
Modelos e Discussões Regulatórias

Módulo IV
Internet, Comportamento do Consumidor e Competitividade

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Formação de Preços em Transporte Aéreo: Modelos e Discussões Regulatórias

Módulo I
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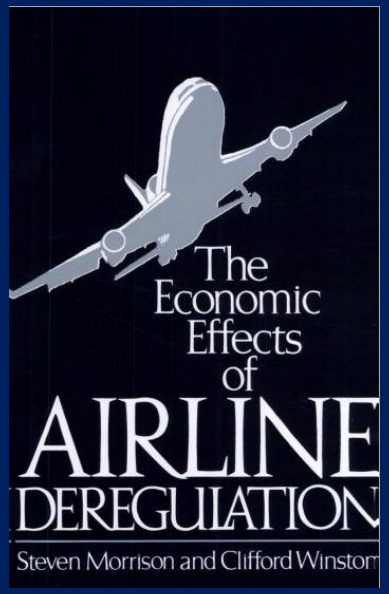
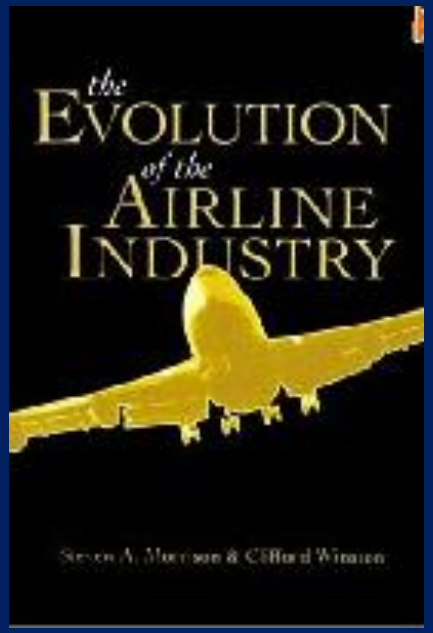
Morrison & Winston (1986)

- Um dos livros mais influentes sobre os impactos da desregulação norte-americana
- Morrison & Winston (1986)
  The Economic Effects of Airline Deregulation



MW86

- Novos cálculos da dupla em 1995, com a obra *The Evolution of Airline Industry*



MW86

- Objetivo: medir os efeitos da desregulação do mercado aéreo americano no bem-estar econômico (ADA, 1978)
- ADA = *Airline Deregulation Act*, Jimmy Carter
- Primeira desregulação do traer no mundo
- Intenso debate na década de 1970
- Diferenças entre a jurisdição
  - CAB (*Civil Aeronautics Board*), interestadual (regulado)
  - e o intraestadual (não-regulado) = California e Texas (Southwest Airlines)
- Extinção do CAB em 1985.

MW86 – Equação de Preços

Variáveis

- ***Average Fare:*** receita média por passageiros
- ***Fuel Price:*** preço médio do combustível consumido, em centavos por galão (custos)
- ***Wage:*** salários médios, em dólares por ano (custos)
- ***Distance:*** distância de viagem média por passageiro, em milhas (indicador de qualidade do serviço)
- ***Departures:*** número médio de partidas semanais por cidade servida (indicador de qualidade do serviço)

dados agregados, 1980 a 1982

MW86 – Equação de Preços

$$\log(\textit{Average fare}) = \underset{(1.310)}{-4.677} + \underset{(0.1519)}{0.4136}\log(\textit{Fuel price}) + \underset{(0.1276)}{0.5449}\log(\textit{Wage}) + \underset{(0.0305)}{0.4802}\log(\textit{Distance}) + \underset{(0.0307)}{0.0760}\log(\textit{Departures})$$

$$R^2 = 0.92.$$

MW86 – Equação de Preços

Exercício de previsão, obtêm o seguinte deflator:

$$\frac{(Predicted\ fare)\ 1983}{(Predicted\ fare)\ 1977} = 1.93.$$

- Deflacionam as tarifas desreguladas de 1983 por meio desse deflator para obter uma estimativa das tarifas desreguladas (contrafactual de desregulação na variável preços em 1977).

MW86 – Equação de Preços

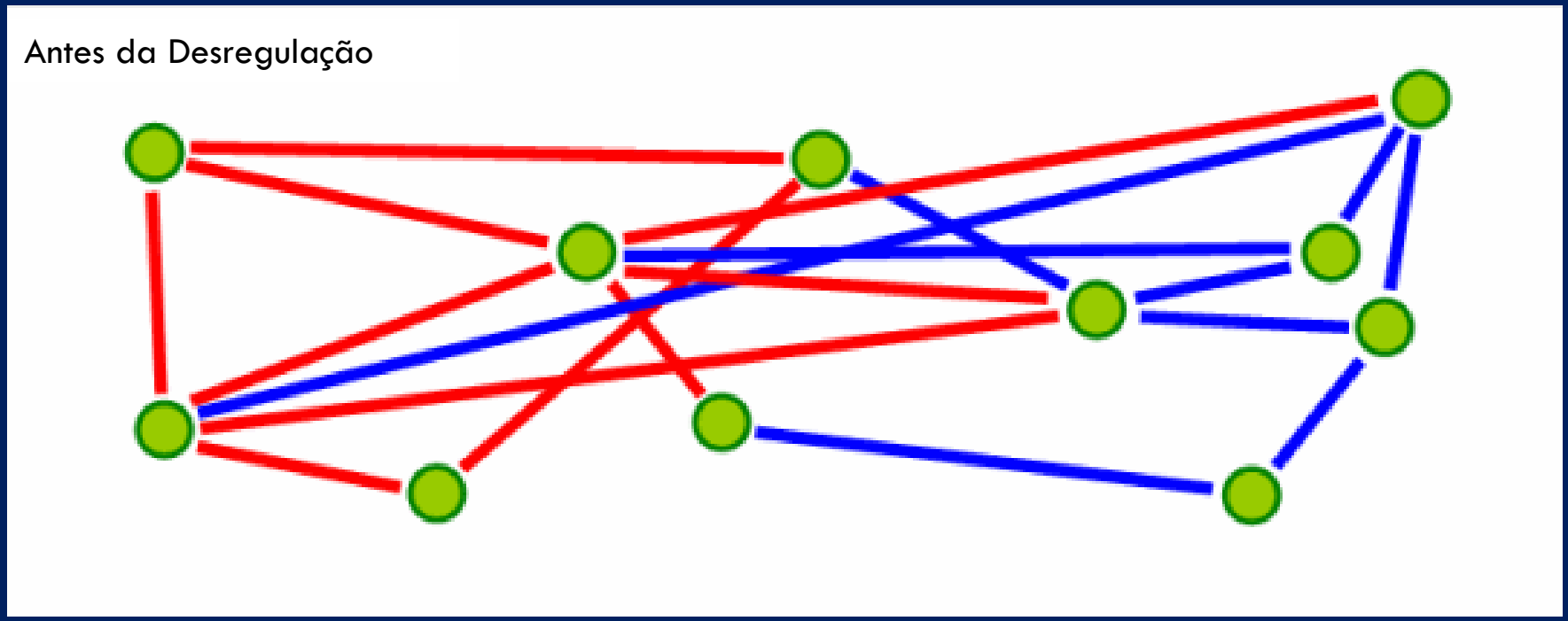
Table 3-1. Actual and Predicted Revenue Yields per Passenger-Mile, 1977–83
Cents

Year	*Actual yields*	*Fully deregulated yields based on fare deflator*	*Fully deregulated yields based on ATA cost deflator*[a]
1977	8.4	6.0	6.4
1978	8.3	6.6	6.9
1979	8.7	8.0	7.9
1980	11.0	10.2	9.8
1981	12.3	11.4	11.1
1982	11.8	11.6	11.4
1983	11.6	11.6	11.6

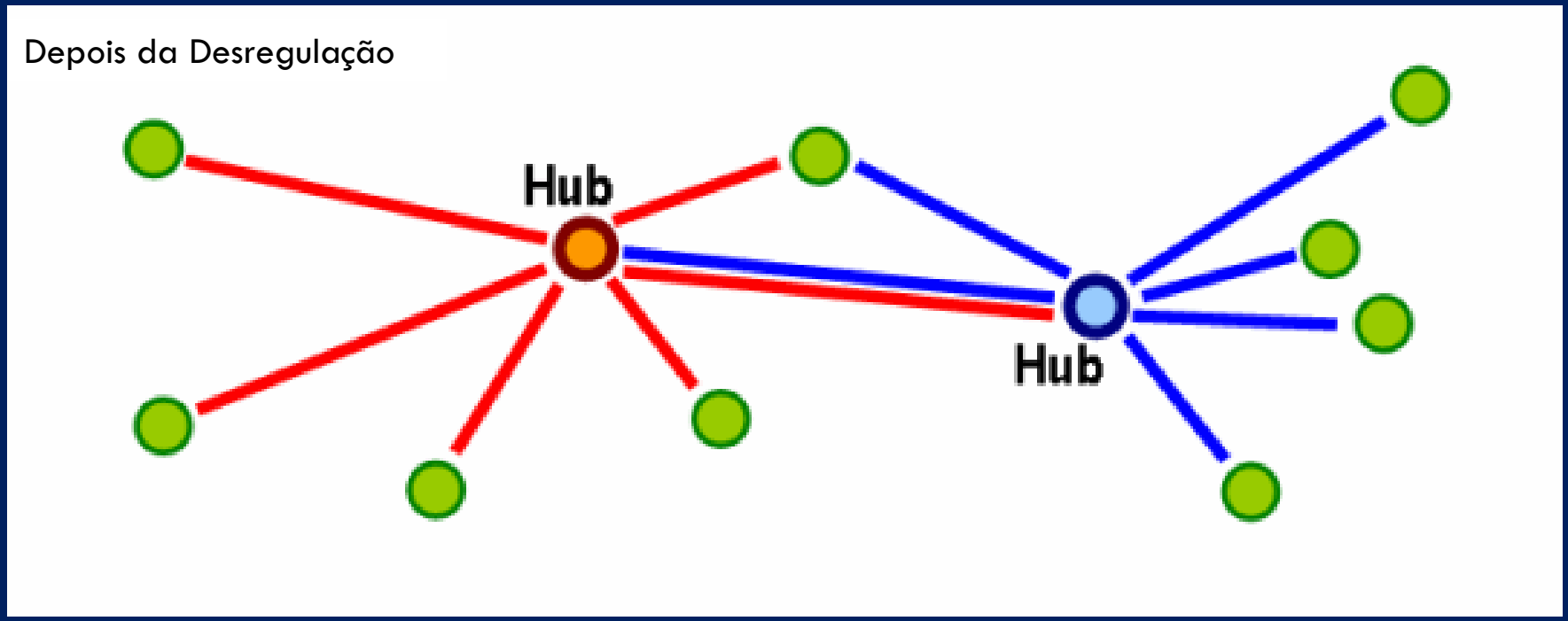
Source: Authors' calculations. Actual yields are from the Air Transport Association of America, *Air Transport 1984: The Annual Report of the U.S. Scheduled Airline Industry* (Washington, D.C.: ATA, 1984).

a. ATA deflator is 1.82.

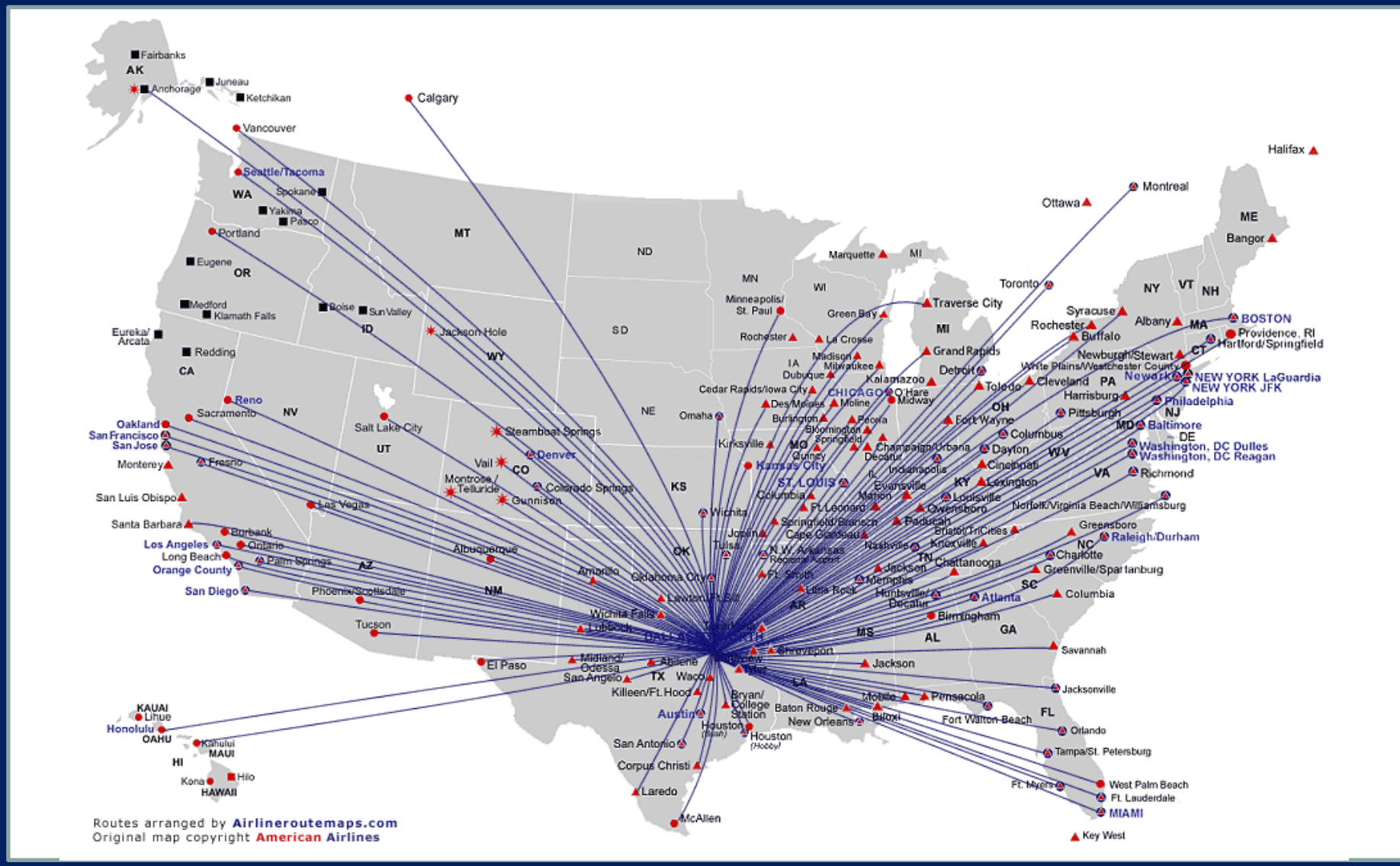
Efeito do *Airline Deregulation Act*



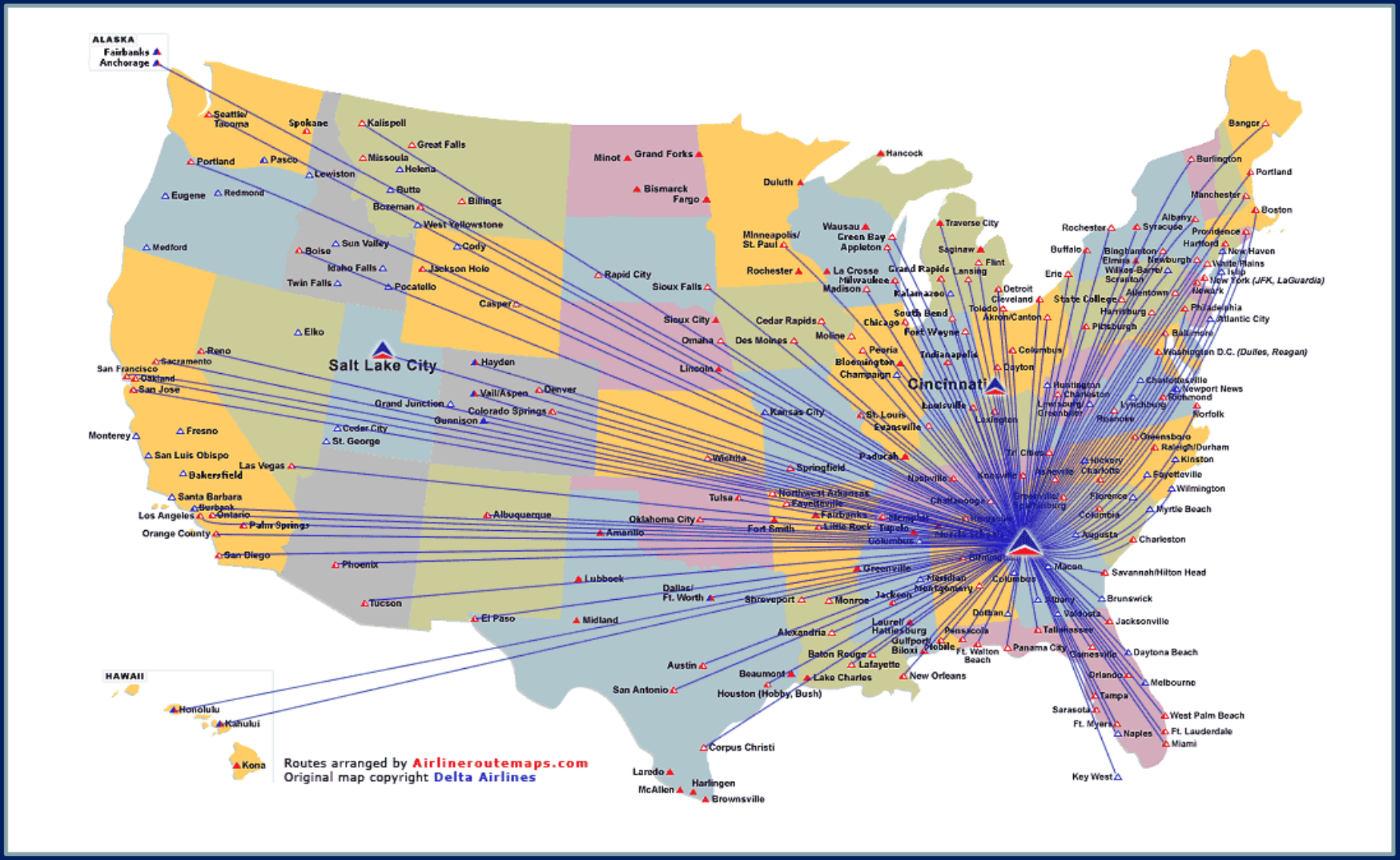
Efeito do *Airline Deregulation Act*



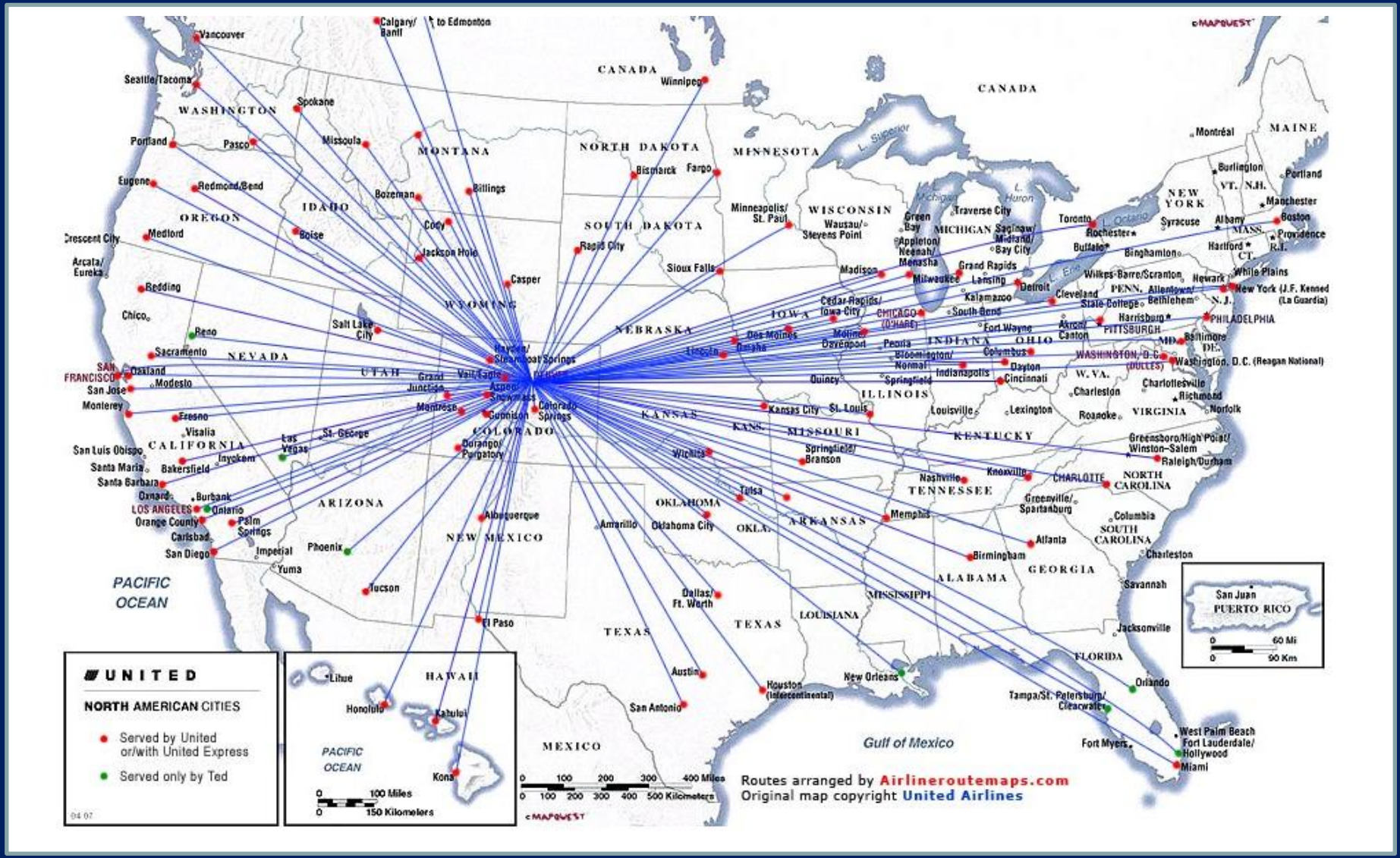
Dallas (American Airlines)



Atlanta (Delta Airlines)



Denver (United Airlines)



Dominância e Poder de Mercado

- Grandes empresas baseadas na estrutura de rede "hub-and-spoke" (H&S)
  - "network carriers" ou "legacy carriers"
- aumento do poder de mercado devido ao *hubs*
  - *Fortress hubs*: aeroportos onde a empresa detém mais de 65-70% das operações, monopolista em várias rotas.
- Gerou uma importante corrente da literatura
  - estudo dos impactos dos *hubs* nas tarifas aéreas.
- OK, MW86 estimam ganhos de curto prazo com a desregulação. Mas e no longo prazo?
  - Qual o efeito do H&S?

Borenstein (1989)

Hubs and high fares: dominance and market power in the U.S. airline industry

Severin Borenstein*

RAND Journal of Economics
Vol. 20, No. 3, Autumn 1989

This article estimates the importance of route and airport dominance in determining the degree of market power exercised by an airline. *The results indicate that an airline's share of passengers on a route and at the endpoint airports significantly influences its ability to mark up price above cost. (...)*

Borenstein (1989)

- Preocupação com a dominância dos hubs
  - Base de dados desagregados de 1987 (*survey US DOT DB1A*)
- Estima a importância da dominância de rota e aeroporto no poder de mercado
- Uso de modelo econométrico de preços
  - principais regressores:
    - poder de mercado e concentração
    - tanto na rota e no aeroporto

Borenstein (1989)

$$\ln P_{ij} = \alpha_i + \beta_1 \ln DISTANCE_j + \gamma_1 \ln LOADFAC_{ij} + \gamma_2 \ln EQUIP_{ij}$$
$$+ \gamma_3 \ln FREQ_{ij} + \gamma_4 \ln CIRC_{ij} + \gamma_5 STOP_{ij} + \gamma_6 PLANECHG_{ij}$$
$$+ \delta_1 ORGSHARE_{ij} + \delta_2 ORGHERF_j + \delta_3 RUTSHARE_{ij} + \delta_4 RUTHERF_j$$
$$+ \delta_5 \ln COMPCOST_{ij} + \delta_6 \ln TOURIST_j + \sum_{k=1}^{24} \rho_k APT_k, \qquad (1)$$

Borenstein (1989)

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$$+ \delta_1 ORGSHARE_{ij} + \delta_2 ORGHERF_j + \delta_3 RUTSHARE_{ij} + \delta_4 RUTHERF_j$$
$$+ \delta_5 \ln COMPCOST_{ij} + \delta_6 \ln TOURIST_j + \sum_{k=1}^{24} \rho_k APT_k, \qquad (1)$$

— P_{ij} is the xth percentile fare, $x = 20, 50, 80$, paid to the observed airline on this route. Round-trip tickets are broken down as two one-way trips, for which the fare on each trip is half the round-trip fare.

Borenstein (1989)

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$$+ \delta_5 \ln COMPCOST_{ij} + \delta_6 \ln TOURIST_j + \sum_{k=1}^{24} \rho_k APT_k, \qquad (1)$$

—$ORGSHARE_{ij}$ is the weighted average of the observed carrier's share of daily passenger originations at the two endpoints of the observed route (in the third quarter of 1987). The weighting is according to the proportion of passengers on the route who originate their trips at each endpoint. Increases in *ORGSHARE* may lead to greater market power and prices. (sign: +)

Borenstein (1989)

$$\ln P_{ij} = \alpha_i + \beta_1 \ln DISTANCE_j + \gamma_1 \ln LOADFAC_{ij} + \gamma_2 \ln EQUIP_{ij}$$
$$+ \gamma_3 \ln FREQ_{ij} + \gamma_4 \ln CIRC_{ij} + \gamma_5 STOP_{ij} + \gamma_6 PLANECHG_{ij}$$
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$$+ \delta_5 \ln COMPCOST_{ij} + \delta_6 \ln TOURIST_j + \sum_{k=1}^{24} \rho_k APT_k, \qquad (1)$$

—$ORGHERF_j$ is the weighted average of the Herfindahl indices (measured as zero to one) for passenger originations at the two endpoints of the observed route. The weighting is the same as for *ORGSHARE*. The effects discussed in Section 2 indicate that an airline might prefer that its competition were many very small firms rather than one larger airline. On the other hand, tacit or explicit coordination among competitors that allows a reduction of competition, such as an agreement not to enter one another's route, is less costly to attain and more likely to succeed when there are few competitors to include. (sign: ?)

HERF = HHI = Herfindhal-Hirschman Index

Borenstein (1989)

$$\ln P_{ij} = \alpha_i + \beta_1 \ln DISTANCE_j + \gamma_1 \ln LOADFAC_{ij} + \gamma_2 \ln EQUIP_{ij}$$
$$+ \gamma_3 \ln FREQ_{ij} + \gamma_4 \ln CIRC_{ij} + \gamma_5 STOP_{ij} + \gamma_6 PLANECHG_{ij}$$
$$+ \delta_1 ORGSHARE_{ij} + \delta_2 ORGHERF_j + \delta_3 RUTSHARE_{ij} + \delta_4 RUTHERF_j$$
$$+ \delta_5 \ln COMPCOST_{ij} + \delta_6 \ln TOURIST_j + \sum_{k=1}^{24} \rho_k APT_k, \qquad (1)$$

— $RUTSHARE_{ij}$ is the observed carrier's share of all local origin-to-destination passengers on the observed route. If there is not a complete umbrella effect from the market power of a dominant firm, then, controlling for concentration on the route, the firm with a larger share would be expected to have higher prices. (sign: +)

Clearly, the effects of *ORGSHARE* and *RUTSHARE* are related. Borenstein (1989) estimates that a dominant presence at an airport significantly increases an airline's share of the passengers on any route that includes that airport. A 1% increase in the share of originations at an airport is estimated to cause an increase in share on a route of up to 0.33%, depending on the share of the route that the carrier already possessed. Thus, the increase in airport dominance would also increase fares indirectly by increasing its share of traffic on each route that the carrier serves from the airport.

Borenstein (1989)

$$\ln P_{ij} = \alpha_i + \beta_1 \ln DISTANCE_j + \gamma_1 \ln LOADFAC_{ij} + \gamma_2 \ln EQUIP_{ij}$$
$$+ \gamma_3 \ln FREQ_{ij} + \gamma_4 \ln CIRC_{ij} + \gamma_5 STOP_{ij} + \gamma_6 PLANECHG_{ij}$$
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$$+ \delta_5 \ln COMPCOST_{ij} + \delta_6 \ln TOURIST_j + \sum_{k=1}^{24} \rho_k APT_k, \qquad (1)$$

—$RUTHERF_j$ is the Herfindahl index (measured as zero to one) for all local O & D passengers on the observed route. To the extent that a dominant firm's high prices create an umbrella that allows a few firms in a concentrated market to collude more easily, then increases in concentration will increase price, holding constant the observed firm's share. If, however, a dominant firm on a route has a competitive advantage, through marketing devices, advertising, or other means, it could possibly lower the profit-maximizing price for other firms in the market. (sign: ?)

TABLE 2 **Regression Results**

Dependent Variable:	Equation 1—2SLS			*POTCOMP* Variable Included			Ordinary Least Squares		
	ln *FR20*	ln *FR50*	ln *FR80*	ln *FR20*	ln *FR50*	ln *FR80*	ln *FR20*	ln *FR50*	ln *FR80*
ln *DISTANCE*	0.4138*	0.3348*	0.3559*	0.4061*	0.3274*	0.3489*	0.4067*	0.3318*	0.3662*
	(0.0103)	(0.0124)	(0.0133)	(0.0098)	(0.0118)	(0.0127)	(0.0093)	(0.0112)	(0.0120)
ln *LOADFAC*	−0.0754*	−0.0425	−0.0240	−0.0779*	−0.0445	−0.0258	−0.0762*	−0.0427	−0.0232
	(0.0264)	(0.0318)	(0.0341)	(0.0264)	(0.0318)	(0.0342)	(0.0263)	(0.0318)	(0.0341)
ln *EQUIP*	−0.0160	−0.0050	−0.0691*	−0.0140	−0.0031	−0.0673*	−0.0136	−0.0043	−0.0718*
	(0.0187)	(0.0225)	(0.0242)	(0.0186)	(0.0225)	(0.0242)	(0.0186)	(0.0225)	(0.0241)
ln *FREQ*	0.0140#	0.0236*	0.0428*	0.0144#	0.0237*	0.0427*	0.0128#	0.0233*	0.0440*
	(0.0078)	(0.0094)	(0.0101)	(0.0078)	(0.0094)	(0.0101)	(0.0077)	(0.0093)	(0.0100)
ln *CIRC*	0.1458*	0.1272*	0.2062*	0.1352*	0.1190*	0.1980*	0.1296*	0.1258*	0.2124*
	(0.0412)	(0.0497)	(0.0533)	(0.0407)	(0.0491)	(0.0529)	(0.0399)	(0.0482)	(0.0516)
STOP	−0.0470	−0.0340	−0.1327*	−0.0482#	−0.0354	−0.1336*	−0.0432	−0.0343	−0.1320*
	(0.0292)	(0.0352)	(0.0377)	(0.0291)	(0.0352)	(0.0378)	(0.0290)	(0.0350)	(0.0375)
PLANECHG	−0.0293*	−0.0776*	−0.0616*	−0.0342*	−0.0818*	−0.0652*	−0.0298*	−0.0782*	−0.0596*
	(0.0111)	(0.0134)	(0.0144)	(0.0113)	(0.0136)	(0.0146)	(0.0111)	(0.0133)	(0.0143)
ORGSHARE	0.0345	0.1254#	0.1191#	0.0365	0.1227#	0.1205#	0.0819#	0.1229*	0.1228†
	(0.0549)	(0.0661)	(0.0710)	(0.0536)	(0.0647)	(0.0696)	(0.0426)	(0.0514)	(0.0551)
ORGHERF	−0.0699	−0.0893	0.0766	−0.0684	−0.0750	0.0934	−0.0264	−0.0660	−0.0033
	(0.0623)	(0.0751)	(0.0806)	(0.0633)	(0.0764)	(0.0822)	(0.0543)	(0.0656)	(0.0702)
RUTSHARE	0.1120#	0.0288	0.2238*	0.1196†	0.0564	0.2470*	0.0899*	0.0596#	0.1259*
	(0.0606)	(0.0731)	(0.0784)	(0.0577)	(0.0697)	(0.0749)	(0.0270)	(0.0326)	(0.0349)
RUTHERF	0.1559†	0.1822†	−0.1787†	0.1262#	0.1286	−0.2302*	0.1128*	0.1323*	−0.0120
	(0.0696)	(0.0839)	(0.0901)	(0.0659)	(0.0795)	(0.0855)	(0.0329)	(0.0397)	(0.0425)
ln *COMPCOST*	0.5042*	0.7010*	0.8374*	0.5000*	0.6929*	0.8309*	0.5134*	0.6944*	0.8580*
	(0.0453)	(0.0546)	(0.0586)	(0.0450)	(0.0543)	(0.0584)	(0.0430)	(0.0519)	(0.0556)
ln *TOURIST*	−0.0187*	−0.0558*	−0.0991*	−0.0183*	−0.0552*	−0.0986*	−0.0180*	−0.0553*	−0.1007*
	(0.0058)	(0.0070)	(0.0076)	(0.0058)	(0.0070)	(0.0076)	(0.0058)	(0.0070)	(0.0075)
POTCOMP				−0.0589†	−0.0449	−0.0380			
				(0.0289)	(0.0348)	(0.0375)			
R-SQUARED	0.683	0.494	0.508	0.683	0.493	0.507	0.683	0.494	0.511
OBS	3591	3591	3591	3591	3591	3591	3591	3591	3591

Borenstein (1989)

Hubs and high fares: dominance and market power in the U.S. airline industry

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Evans & Kessides (1993)

LOCALIZED MARKET POWER IN THE U.S. AIRLINE INDUSTRY

William N. Evans and Ioannis N. Kessides*

The Review of Economics and Statistics, Vol. 75, No. 1 (Feb., 1993), pp. 66-75

Abstract—This paper tests whether the observed dominance of most city-pair markets and airports in the U.S. domestic airline industry by single carriers confers any pricing power on the dominant firms. The results of fixed-effects estimation indicate that airport dominance by a carrier does confer upon it substantial pricing power, whereas dominance at the route level seems to confer no such pricing power. Additionally, we find a positive, yet small, correlation between both route concentration, and price and airport concentration and price. The quantitative importance of airport dominance reveals that the most promising direction for public policy aimed at improving the industry's performance is to ensure equal access to sunk airport facilities.

dados USDB1A: 1988

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dados USDB1A: 1988

TABLE 2.—LEAST-SQUARE ESTIMATES OF $\ln(Price_{ij})$ EQUATION PARAMETER ESTIMATES AND STANDARD ERRORS[a]

Independent Variable	Fixed-Effects	Fixed-Effects/IV_1	Fixed-Effects/IV_1	OLS	Random-Effects
Intercept	—	—	—	−0.447	−0.573
				(0.427)	(0.479)
$\ln(Miles_j)$	—	—	—	1.142	1.314
				(0.108)	(0.153)
$[\ln(Miles_j)]^2$	—	—	—	−0.055	−0.065
				(0.008)	(0.012)
$Direct_{ij}$	0.054	0.049	0.077	0.002	0.047
	(0.009)	(0.011)	(0.010)	(0.014)	(0.009)
$Round_{ij}$	−0.372	−0.379	−0.381	−0.277	−0.328
	(0.027)	(0.028)	(0.026)	(0.044)	(0.026)
Market Share$_{ij}$	−0.044	−0.021	0.153	0.140	−0.016
	(0.017)	(0.029)	(0.019)	(0.032)	(0.017)
Herfindahl$_j$	—	—	—	0.068	0.082
				(0.026)	(0.038)
Airport Market Share$_{ij}$	0.562	0.538	—	0.201	0.489
	(0.033)	(0.042)		(0.040)	(0.032)
Airport Herfindahl$_j$	—	—	—	0.213	0.189
				(0.040)	(0.059)
R^2	0.901	0.901	0.897	0.490	—
S.E.R.	0.130	0.130	0.134	0.267	—
Specification Test[b]	—	—	—	—	$\chi^2_{25} = 1031$

[a] Firm-effects not reported.

[b] Hausman specification test of the equivalence of fixed and random effects estimates. The test statistic is distributed as chi-squared with 25 degrees of freedom. The degrees of freedom equal the number of estimable parameters in the fixed-effects model, which in this case include $Round_{ij}$, $Direct_{ij}$, *Airport Market Share*$_{ij}$, *Route Market Share*$_{ij}$, and 21 airline dummy variables.

Conclusão

- Houve ganhos de curto prazo com o ADA (MW 1986)
  - Os ganhos se mantiveram em análises posteriores (ex. MW 1995), há evidências de ganhos de longo prazo
- A concentração do final dos anos 1980 foi uma preocupação da literatura
  - cias dominantes de hubs conseguem exercer maior poder de mercado que outras cias (Borenstein, 1989 e Evans & Kessides, 1993)
  - o poder de mercado está localizado nos aeroportos e não nas rotas propriamente ditas (Evans & Kessides, 1993).
- Inovação nos modelos: uso das *surveys* do USDOT