

Do Liberalized Aviation Agreements Actually Decrease Airline Concentration?

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Although numerous studies have focused on the effects of airline deregulation within the United States (and to a lesser degree, in the European Union), comparatively few have focused on the more restricted international realm. In an earlier work I describe the traditional international structure as follows:

Nations negotiated with each other over the following ‘freedoms’ of its airlines (typically only the country’s flag carrier) to serve the other’s country: which companies could operate, what cities they could operate between, when they could operate, how much capacity they could offer, and how much they could charge....Because countries sought to protect their flag carriers, which they viewed as a vital part of their national interest, any changes desired by the airlines would require renegotiation of the appropriate treaty.¹

Two waves of liberalization (both initiated by the U.S.), which began in 1978 and 1992, relaxed and often removed these barriers to entry in the international arena, allowing domestic players to substantially broaden their networks internationally. However, the second round of liberalization—the “open skies” phase—also led to the rise of alliances between carriers, allowing airlines to expand their networks globally with relative ease by entering codeshare agreements with foreign partners. As an incentive for foreign countries to reach open skies accords with the U.S., such alliances are granted antitrust immunity.

This study will examine the effect of international bilateral liberalization on market concentration between countries. While increased access rights would be expected to decrease concentration, the existence and development of alliances would tend to increase it. A better understanding of the nature and degree of these opposing factors will allow policymakers to predict with greater accuracy the effects of liberalized markets on concentration and competition.

¹ Aaron Robinson, *Open Skies Over Poland: An Emerging LCC Battleground* (unpublished, 2006), 1.

Doganis explains how the formation of alliances, can force competitors (even incumbents) to withdraw from certain markets, leading to a decline in nonstop competition on particular city- and country-pairs.² Doganis' anecdotal evidence is corroborated by Gurrea, who finds that codesharing creates strategic barriers that deter new entrants, although he acknowledges that alliances can also lead to efficiency gains.³ Heimer and Shy find that, on balance, codesharing increases company profits at the expense of passengers' welfare, but that social welfare is ultimately higher.⁴ Brueckner and Whalen find that while alliances offer fares 26% lower for itineraries between beyond-gateway cities (i.e., the airports that do not serve as the international gateway in a country-pair), the fares for gateway-to-gateway flights are 5% higher for allied carriers versus if they were previously competing on the route.⁵

As a starting point for the construction of a model to test this hypothesis, I will use the model advanced by Rose in his studies on the effects of World Trade Organization membership on trade⁶ and on the effects of common currencies on trade.⁷ The model in question is a variation of the frequently used "gravity" model of bilateral trade.

My data will consist of panel data from summer 1970 to winter 2006-07 involving all country-pairs for whom an open skies agreement currently exists.⁸ As of November 2006, 122

² Rigas Doganis, *The Airline Business in the Twenty-first Century* (London: Routledge Publishing, 2001), 89-98.

³ Stuart D. Gurrea, "International Airline Code Sharing and Entry Deterrence," *Competition Policy and Antitrust*, vol. 1, *Advances in Airline Economics*, ed. Darin Lee (Cambridge, Mass.: Elsevier, 2006), 132-136.

⁴ Orit Heimer and Oz Shy, "Code-Sharing Agreements, Frequency of Flights, and Profits Under Parallel Operation," *Competition Policy and Antitrust*, 175-177.

⁵ Jan K. Brueckner and W. Tom Whalen, "The Price Effects of International Airline Alliances," *Journal of Law and Economics* 43, no. 2 (October 2000), 542.

⁶ Andrew K. Rose, "Do We Really Know That the WTO Increases Trade?" *The American Economic Review* (March 2004), 99-100.

⁷ Rose, "One money, one market: the effect of common currencies on trade," *Economic Policy* 24 (April 2000), 13-14.

⁸ Because most international schedules change only twice a year, the time unit of observation will be the (Northern Hemisphere) summer or winter timetable of a given year. 1970 was selected as the initial start year because of the introduction of widebody aircraft in January of that year.

such agreements existed, with the U.S. being a party in 75 of those cases.⁹ This is a relatively small percentage of the total, with over 2000 bilaterals in effect.¹⁰

The exact specification to be used is:

$$\begin{aligned} \ln(C_{ijt}) = & \beta_0 + \beta_1 \ln(Y_i Y_j)_t + \beta_2 \ln(Y_i Y_j / \text{Pop}_i \text{Pop}_j)_t + \beta_3 \ln \text{Dist}_{ij} + \beta_4 \text{Cont}_{ij} + \beta_5 \ln(\text{Area}_i \text{Area}_j) \\ & + \beta_6 \text{Colony}_{ij} + \beta_7 \text{DestAccess}_{ijt} + \beta_8 \text{FifthFreedom}_{ijt} + \beta_9 \text{MultiDes}_{ijt} + \beta_{10} \text{Frequency}_{ijt} \\ & + \beta_{11} \text{Capacity}_{ijt} + \beta_{12} \text{FareApp}_{ijt} + \beta_{13} \text{Code}_{ijt} + \beta_{14} \text{All}_{ijt} + \beta_{15} \text{ATI}_{ijt} + \beta_{16} \text{AllLength}_{ijt} \\ & + \beta_{17} \text{ForHub}_{ijt} + \beta_{18} \text{AvgOwn}_{ijt} + \beta_{19} \text{OilPrice}_t + \beta_{20} \text{USA}_{ij} + \varepsilon_{ijt} \end{aligned}$$

where i and j are countries, t denotes time, and the variables are:

- C is the Herfindahl-Hirschman Index of market concentration,¹¹
- Y is real GDP,
- Pop is population,
- Dist is the distance between the countries' respective capitals,
- Cont is a dummy variable denoting contiguous countries,
- Area is the area of the country,
- Colony is a dummy variable denoting whether i ever colonized j , or vice versa,
- DestAccess is a dummy variable denoting whether full destination access was granted,
- FifthFreedom is a dummy variable denoting whether broadened fifth-freedom rights were granted,
- MultiDes is a dummy variable denoting whether multiple carriers from each side were allowed to serve the market,
- Frequency is a dummy variable denoting whether frequency controls were in place,
- Capacity is a dummy variable denoting whether capacity controls were in place,

⁹ Chris Lyle, "Trade wins," *Airline Business* 22, no. 11 (November 2006), 59.

¹⁰ Only these 122 country-pairs will be used because of the dangers of comparing a minute percentage with a larger whole; it may be that the presence of the U.S. as half of a country-pair is itself a special factor that would lead to incorrect generalizations if the results were to be applied to other countries, hence the creation of a dummy variable to mitigate any effects if the U.S. is part of a given country-pair. Danny Quah notes a similar concern in his critique of Rose's work on currency unions.

¹¹ Concentration of two measures will be estimated, frequency (flights per week) and capacity (seats per week). The HHI has been demonstrated to be appropriate for industries characterized by Cournot competition. The airline industry falls into this category since both frequency and capacity are selected before fares are offered for sale.

- *FareApp* is a dummy variable denoting whether fares required unanimous approval by both countries,
- *Code* is a dummy variable denoting whether codesharing was allowed,
- *All* is the total number of alliances in existence between the airlines of *i* and *j*,
- *ATI* is the number of airline alliances that have been granted antitrust immunity,
- *AllLength* denotes the sum of the time periods for which airline alliances were in effect,¹²
- *ForHub* is a dummy variable denoting whether an airline of country *i* had a hub in country *j* or vice versa,
- *AvgOwn* is the average state ownership of all airlines flying between *i* and *j*,
- *OilPrice* is the real price of a barrel of oil and serves as a proxy for fuel prices,¹³
- *USA* is a dummy variable denoting whether the U.S. is either of country *i* or *j*, and
- ε represents omitted other influences, assumed to be well-behaved.

The parameters of interest are β_7 through β_{16} ; β_7 through β_{13} will explain whether or not and to what degree concentration on a particular country-pair is affected by liberalization of bilateral agreements and is expected to have negative coefficients, while β_{14} through β_{16} will capture the effect of alliance participation on country-pair concentration and should have positive coefficients. Additional dummy variables for the year and country-pair are included in the model to control for case-specific factors such as business cycles and peculiarities in specific country-pair markets.

One might wonder why price, so critical in most econometric studies, will not be included in the regression. The reason for this is multifold: first, as discussed earlier, fares were historically negotiated between governments and were not completely subject to market forces. Second, while published fares were originally dependent only on the class of service bought, the

¹² This variable accounts for the fact that alliances exhibit increasing passenger flows and strength over time.

¹³ Higher fuel prices have historically resulted in decreased capacity and inefficient aircraft and marginal routes being reduced or removed from schedules, leading to higher concentration.

advent of yield management in the 1980s led to dozens of fare classes and levels being offered for a particular route. Third, fare levels have been declining in real terms as aircraft have become more efficient and employees more productive, allowing airlines to pass these savings on to consumers. Finally and most critically, Evans, Froeb, and Werden explain why endogeneity between concentration and price occurs: industry performance (price levels) affects structure (concentration), which in turn evolves and affects performance, creating a simultaneous-equations bias.¹⁴

Data for country variables is available from the Penn World Table, the World Bank World Development Indicators, and the CIA World Factbook. Information on the terms of bilateral agreements are on record at the International Civil Aviation Organization, airline schedules and seating configurations to determine concentration levels are available from the Official Airline Guide, and information on state ownership and codeshare agreements are available from the carriers themselves.

While the countries of the developed world have reached a consensus that liberalized aviation markets are both desirable and inevitable, a deeper understanding of how the phases of liberalization affect concentration is critical to achieve the goals of such negotiations—higher consumer welfare through increased competition.

¹⁴ William N. Evans, Luke M. Froeb, and Gregory J. Werden, “Endogeneity in the Concentration-Price Relationship: Causes, Consequences, and Cures,” *The Journal of Industrial Economics* 41, no. 4 (December 1993), 431-433.