

Hubs versus Airport Dominance

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Background

- Airport dominance effect has been documented on the US market
 - Airline with a dominant position at an airport charges more for flight into/from that gateway:
 - As compared to what it charges over the remainder of its network
 - As compared to other airlines flying into the same airport
- What is behind this effect?

Background

- Airport dominance = market power:
 - Market share
- Airport dominance = product differentiation
 - Kahn:
 - Dominant airline attracts more price insensitive passengers
 - Results in price discrimination
 - Welfare impact ambiguous
 - Dominant airline offers access to a network of non-stop destinations
- Frequent flier programs (Borenstein, Lederman)
 - Maybe simple reinforcement of product differentiation
- Most recent (Ciliberto and Williams): access to airport facilities

Idea

- All dominant airlines operate hub; not all hub operators are dominant
- Can potentially separate ‘hub premium’ from ‘dominance premium’
- Pick airports serving as hub for two carriers:
 - Atlanta (Delta and AirTran) – Delta dominates;
 - Denver (United and Frontier) – United dominates;
 - Dallas-Ft. Worth (American and Delta) – American dominates; Delta dismantled its hub several years ago;
 - Phoenix (America West and Southwest) – neither dominates;
 - Chicago O’Hare (American and United) – neither dominates.
- These five combined handle one in six flights within the US.
- Use simple difference-in-differences to get the effects we are interested in.

Previous Studies

- Borenstein (1989)
 - First study of airport dominance effects;
 - Difference in differences;
 - Suggested reasons – frequent flier programs and then prevalent feature of ticket distribution market.
- Borenstein (1991)
 - Shows dominant carrier has larger market share of passengers traveling from the respective airport than to the same.
- Evans, Kessides (1993)
 - Airport dominance is a more important source of market power than route dominance

Previous Studies

- Marin (1995)
 - Analysis of some European markets – no dominance effect observed
 - Further European studies (Lijesen et al., 2001; Bachis and Piga, 2007) found some evidence for the dominance premium.
- Berry, Carnal, Spiller (2006)
 - Structural model
 - Airport dominance effect applies to business travelers
- Lee, Luengo-Prado (2005)
 - Difference in differences
 - Airport dominance premium can be explained by passenger mix

Previous Studies

- Bilotkach (2007)
 - Estimates airport dominance effect for several transatlantic routes
- Lederman (2008)
 - FFP partnerships help non-dominant carriers get dominance premium
- Ciliberto and Williams (forthcoming)
 - About half of the dominance premium can be explained by restricted access to airport facilities

Destinations Served by Main Carriers

	Atlanta		Denver		Dallas		Chicago		Phoenix	
	DL	FL	UA	F9	AA	DL	AA	UA	HP	WN
July 1999	124	30	86	17	120	58	91	88	53	32
July 2000	134	29	80	20	120	63	96	96	54	37
July 2001	138	32	83	29	118	65	93	103	56	38
July 2002	138	36	80	29	119	60	96	84	55	43
July 2003	137	38	81	30	116	66	82	91	58	41
July 2004	137	42	75	36	126	72	109	116	56	42
July 2005	154	45	75	39	135	6	110	119	56	45

Identification – General

- Dominant airline's price for trips to/from the hub includes:
 - Airline effect;
 - Hub effect (product differentiation, loyalty programs)
 - Dominance effect (market share, facilities)
- Same price for non-dominant hub operator includes:
 - Airline effect;
 - Hub effect
- Same price for “third” airlines only includes:
 - Airline effect;
- To control for airline effects for dominant airline and non-dominant hub operator, use fares they charge for flights *through* the airport.

Identification – General

- With fare or yield as dependent variable, the effects we are looking for are identified as follows:
 - Hub effect – difference between
 - $\text{HubOperator} * \text{Non-Stop} + \text{Max} \{ \text{DominantAirline} * \text{Non-Stop}, \text{NonDominantHubOperator} * \text{Non-Stop} \}$, and
 - $\text{OtherCarrier} * \text{Non-Stop}$ interaction
 - Dominance effect – difference between
 - $\text{DominantAirline} * \text{Non-Stop}$ interaction, and
 - $\text{NonDominantHubOperator} * \text{Non-Stop}$ interaction
- For airports with two hub operators and no dominant carrier; no dominance effect should be observed

Data

- DB1B – the ultimate data source for airline pricing research in the US
 - Collected quarterly by US DOT
 - 10% sample of tickets issued in the quarter
 - Domestic data made available free
 - Each entry includes:
 - Fare paid
 - Number of passengers observed paying this fare in this quarter
 - Detailed routing (segment by segment)
 - Destination (identified by directional break)
 - Ticketed and operating carrier for each segment
- We use DB1B for 1999-2005

Sample – Itineraries

- Roundtrips only, within lower 48 states
- One stop at most in either direction
- No open jaws
- To, From or THROUGH one of the five airports in sample
- Restricted economy class itineraries only
 - Encompass wide array of fares
 - Over 85% of all itineraries ticketed as such
 - Most consistent category across airlines and time
- Fares less than 2 cents per mile in 2000 prices (\$100 LA-NY roundtrip) dropped
- Only markets where 100 or more passengers are observed in a given year

Dependent Variable

- Natural logarithm of passenger-weighted mean fare
- Natural logarithm of passenger-weighted mean yield

- Fares in year 2000 dollars
- Weighing at airline-routing level (regional carriers merged with respective major carriers):
- Directional
- Also obtained – standard deviation:
 - Passenger-weighted mean plus standard deviation fare
 - Passenger-weighted mean plus standard deviation yield
 - Passenger-weighted mean minus fraction of standard deviation yield
- Result – over 600,000 observations; 5400 directional airport-pair markets

Model and controls

- Directional airport-pair market fixed effects
 - Same airport-pair market includes multiple possible routings between the cities
- Controls – dummies and interactions
 - Airline
 - Year
 - Quarter
 - Year-quarter
 - Non-stop flight
- Controls – continuous variables
 - HHI
 - separately for non-stop and one-stop services
 - one stop services – irrespective of routing
 - Distance (total roundtrip)
 - Airline's market share (separately for non-stop and one-stop)
 - Geometric average for endpoints' population

Instruments

- HHI – same lagged one year
- Market share – more complicated:
 - Airline's average market share for flights to/from a given airport excluding the current service.
 - In spirit of using other markets' characteristics to instrument for endogenous variables.
 - Correlation with market share = 0.51

Results

- Airport dominance effect is more pronounced in average fares than at the right end of distribution
- Hub effect is more pronounced at the right end of price distribution
- Estimated airport dominance effect is lower in instrumental variables regressions
- More stable results (and better fit) for yield than price
- Considerable variation across the airports
 - REVERSE results for Dallas
 - Some specifications report dominance effect for Phoenix where it should not exist

Numbers

- Yield as dependent variable, entire sample, IV
 - Average yield:
 - Hub operator's premium over other airlines' yields – 8.3 percent
 - Premium of 1.58 cents per mile (year 2000 yield)
 - Dominant hub operator's premium over non-dominant – 5.5 percent
 - Premium of 1.23 cents per mile
 - Average route (NOT passenger weighted): 1200 miles
 - Dominance premium: \$30; hub premium: \$38
 - High yield:
 - Hub operator's premium – 18 percent (consistent with higher valuation of quality by presumably less price sensitive customers)
 - About 9.4 cents per mile.
 - Non-dominant hub operators' yield is 6 percent above dominant.
 - Shows up only in IV regressions; FE gives 10 percent dominance premium

Discussion

- Market share helps the hub operator charge premium in the middle of price distribution
- What is observed on top of the distribution is mostly hub premium, related to:
 - Product differentiation?
 - Frequent flier programs?
 - Looks observationally equivalent, since FFPs are used to reinforce/ yield product differentiation; high fares likely purchased by frequent fliers.
- Look at the lower end of distribution:
 - Tickets likely purchased for their price
 - Any hub premium observed at the lower end is due to product differentiation
- **There is no hub premium at the lower end of distribution**

Implications

- Suggested sources of the hub operator's market power:
 - Airport dominance (i.e., dominance in terms of the market share at the airport);
 - Is present everywhere along the price distribution;
 - Increases in absolute value as we move to the right; BUT
 - Its share in the total pricing premium declines as we move to the right;
 - Hub premium:
 - Is more pronounced on the right side of the price distribution;
 - Pretty much absent on the left
 - This is more consistent with frequent flier programs than with product differentiation explanation
- The magnitude of the total premium is higher at the upper end of the distribution, but there the source is NOT airport dominance
- Cannot rule out restricted access to airport facilities as a factor behind dominance premium