Homework 2

Econ 818: Empirical IO.

Due on March 3, 2016
Each group hands in only one homework.

1. Download the dataset Airline1997data.dta.

2. The following variables are included:

- year - year when the travel occurred
- quarter - quarter when the travel occurred
- maket - the combination of origin and destination airports
- origin - the origin airport
- dest - the destination airport
- tkcarrier - the carrier who transported the passengers (e.g. American – AA)
- T100nonstop - whether the market was served nonstop or connecting bby the airline (an airline can serve the market either way, or both)
- marketdistanceticket - nonstop distance in miles
- totalpassengers - passengers transported by the carrier
- MdW_oneway_itinfare_ticket
- marketsize = market size - total potential demand.

3 Describe the price and quantity (totalpassengers) variables.

- In particular, report means, medians, standard deviation, min and max. Also, report histograms for the variables. Discuss.

- Are there any variables for which we should be concerned about outliers? Which ones?
- How are ticket fares related to market distance? Show this by replicating your analysis on the fares by looking at different segments; by using scatter plots; and by running a simple OLS regression of prices on market distance. Discuss.

4 Now, consider different groups of carriers:

Legacy carriers: AA CO DL NW TW UA US
Southwest (WN)
Other LCCs (all other carriers)

- Present the summary statistics as in 3) but by groups of firms. Discuss.

- Generate new characteristics: for each ticketing carrier, generate a new variable that is the network of markets served out of an origin airport. Basically, you need to count, for each airport-ticketing carrier pair, how many markets were served (careful not to double count if a ticketing carrier provides both connecting and nonstop service).

1 Logit Case

- This is the "logit model" studied at page 250 in Berry 1994. Equaion 14.
- Compute the share for the outside good and of the all goods (just divide the number of total passengers by the market size)
- What can you say about the outside good? Is it large or small?

1.1 Simple OLS

Now, consider the following specification for the utility function:

$$u_{ijmt} = -\alpha p_{jmt} + x_{jmt}\beta + \xi_{jmt} + \epsilon_{ijmt}.$$

- In this model the x_{jmt} are market distance and the network variable.

- Assume that ϵ_{ijm} has a type I extreme value distribution, so that we can write the aggregate shares as (if the utility of the outside good is normalized to zero):

$$s_{jmt} = \frac{\exp\left(-\alpha p_{jmt} + x_{jmt}\beta + \xi_{jmt}\right)}{1 + \sum_{k=1}^{J} \exp\left(-\alpha p_{kmt} + x_{kmt}\beta + \xi_{kmt}\right)}.$$

- Estimate the parameters of the utility function using a simple OLS approach. Comment on your results.
- Plot the distribution of the residuals, ξ_{jmt}. Comment on the graph.
- Compute the elasticity of demand for each good in each market. Summarize your findings on the elasticity of demand, and comment them.
- Assuming that the airline firms behave as Betrand oligopolists, determine the marginal costs implied by your estimates, and the associated market powers. Be careful with multi-product firms if they are around.

1.2 OLS with Fixed Effects

Now, consider the following specification for the utility function:

$$u_{ijmt} = -\alpha p_{jmt} + x_{jmt}\beta + \bar{\xi}_j + \Delta\xi_{jmt} + \epsilon_{ijmt}.$$

We have added brand/airline fixed effects.

Assume that ϵ_{ijmt} has a type I extreme value distribution, so that we can write the aggregate shares as (if the utility of the outside good is normalized to zero):

$$s_{jmt} = \frac{\exp\left(-\alpha p_{jmt} + x_{jmt}\beta + \bar{\xi}_j + \Delta\xi_{jmt}\right)}{1 + \sum_{k=1}^{J} \exp\left(-\alpha p_{kmt} + x_{kmt}\beta + \bar{\xi}_j + \Delta\xi_{jmt}\right)}.$$

- Estimate the parameters of the utility function using a simple OLS approach with fixed effects. Comment on your results and compare them to those when you do not include brand fixed effects.

- Plot the distribution of the residuals, $\Delta\xi_{jmt}$. Comment on the graph.
- Compute the elasticity of demand for each good in each market. Summarize your findings on the elasticity of demand, and comment them.
- Assuming that the airline firms behave as Betrand oligopolists, determine the marginal costs implied by your estimates, and the associated market powers. Be careful with multi-product firms if they are around.
- Compare your results to those you derived when you run OLS without fixed effects.

1.3 IV without Fixed Effects

Now, consider the following specification for the utility function:

$$u_{ijmt} = -\alpha p_{jmt} + x_{jmt}\beta + \xi_{jmt} + \epsilon_{ijmt}.$$

We have added brand fixed effects.

Assume that ϵ_{ijmt} has a type I extreme value distribution, so that we can write the aggregate shares as (if the utility of the outside good is normalized to zero):

$$s_{jmt} = \frac{\exp\left(-\alpha p_{jmt} + x_{jmt}\beta + \xi_{jmt}\right)}{1 + \sum_{k=1}^{J} \exp\left(-\alpha p_{kmt} + x_{kmt}\beta + \xi_{jmt}\right)}.$$

- Estimate the parameters of the utility function using a simple IV approach without fixed effects.
- The IVs are the functions described by BLP of the characteristics, the network values, for the competitors in the market.
- Plot the distribution of the residuals, ξ_{jmt}. Comment on the graph.
- Compute the elasticity of demand for each good in each market. Summarize your findings on the elasticity of demand, and comment them.
- Assuming that the airline firms behave as Betrand oligopolists, determine the marginal costs implied by your estimates, and the associated market powers. Be careful with multi-product firms if they are around.

- Compare your results to those you derived when you run OLS without fixed effects.

2 Nested Logit Case

- Now, consider the model called "nested logit" at page 252 in Berry 1994, Equation (28).
- As in Berry 1994, the only member of the group zero is the outside good. So, the travelers can choose between flying and not flying, and if they fly, then they choose among the inside goods.
- Compute the elasticity of demand for each good in each market. Summarize your findings on the elasticity of demand, and comment them.
- Assuming that the airline firms behave as Betrand oligopolists, determine the marginal costs implied by your estimates, and the associated market powers. Be careful with multi-product firms if they are around.
- Compare your results to those you derived when you run OLS without fixed effects.

3 Two nests logit demand.

- Go to the webpage sites.google.com/site/frankverbo/data-and-software/merger-simulation-with-nested-logit-demand.
- Install their software in Stata.
- Now, model the airline nests as above
  - Legacy carriers: AA CO DL NW TW UA US
  - Southwest (WN).
  - Other LCCs (all other carriers)
- What would you think of the merger of AA with US? and of the merger of DL and US? Discuss.