Economics 2610: Industrial Organization I

Harvard University, Fall Semester 2002
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Final Examination

January 13, 2003

The exam contains four equally-weighted questions. Please answer any three questions. The exam is open-book, open-note, but you may not consult any other individual. Please turn in the exam to the TEAM office within 24 hours of the time that you start, and no later than noon on January 14.

1) Identification of market conduct

a - Bresnahan (1982) provides an argument that demand rotators are needed to identify market conduct in a homogeneous goods industry. Explain why demand rotators are *not* needed if we assume that costs are known.

b - Now consider Genesove and Mullin (1998). They do not have any demand rotators. Initially, they assume that costs are known and use this assumption to identify market conduct. However, later on, they allow costs to be unknown but are still able to estimate market conduct. How is this consistent with Bresnahan's result?

c - What if you had different sales tax rates across states for the same product. Assume that per-capita demand is the same in every state and that the tax rates are exogenous. What assumptions on costs would you need to make to identify market conduct?

2) Discrete choice estimation

Consider a standard discrete-choice logit demand system with an unobserved product characteristic where $u_{ij} = x_j\beta - \alpha p_j + \xi_j + \varepsilon_{ij}$ and $mc_j = w_j\gamma + \omega_j$ as in Berry (1994).

a - Explain why the sum of other product characteristics form a good instrument for price under Bertrand competition. Would they also form a good instrument for price under collusion? Could you use these data to distinguish between Bertrand competition and collusion? If so, what sort of data would you need?

b - Now suppose that you have a standard discrete choice data set, as in Assignment 1, but that the data on quantity for each product is missing from the data set. Note that you still have price and the utility and cost characteristics for each product. How would you estimate a Berry style model for this data set? What moment conditions would you use?

(This exam is continued on the next page.)

3) Production functions

Consider a Cobb-Douglas production function, à la Olley and Pakes (1996), where firms i are observed over times t: $y_{it} = \alpha k_{it} + \beta l_{it} + \omega_{it}$, where y, k, and l denote the logs of output, capital and labor respectively.

a - Explain why capital and labor are endogenous in this framework. Would you expect the β coefficient on labor from a straightforward regression to be biased upwards or downwards? (An intuitive explanation is fine.) Suppose you have a panel of firms and include firm level fixed effects γ_i in the production function. Provide a specification under which capital and labor inputs are no longer endogenous.

b - Now suppose that, unlike Olley and Pakes, you have estimates of electricity usage but not investment. Assume that electricity usage is chosen on the spot market at the same time as labor. Thus, labor and electricity can be expressed as a function of the state variables ω and k, i.e. $(l_{it}, e_{it}) = f(k_{it}, \omega_{it})$. Can you use electricity to obtain consistent estimates of the production function as do Olley and Pakes? If so, explain what assumptions you would need. (Hint: Make sure to work through the differences in the assumed timing of when investment is chosen and when electricity is chosen, and what these imply for the underlying dynamic model.)

4) Firm entry

Consider airline data such as that used by Berry (1992) which lists the entry decisions for airlines into any city-pair market.

a - Suppose that for city-pairs with higher population, the number of air carriers serving a route increases at a rate less than proportional to the population increase. Bresnahan and Reiss provide two potential explanations for this. What are those explanations? What explanations for this phenomenon are implicit in the Berry model?

b - Suppose now that the number of air carriers serving a route increases at a rate more than proportional to the population. Does the Bresnahan and Reiss model provide any potential explanation for this? What about Berry?